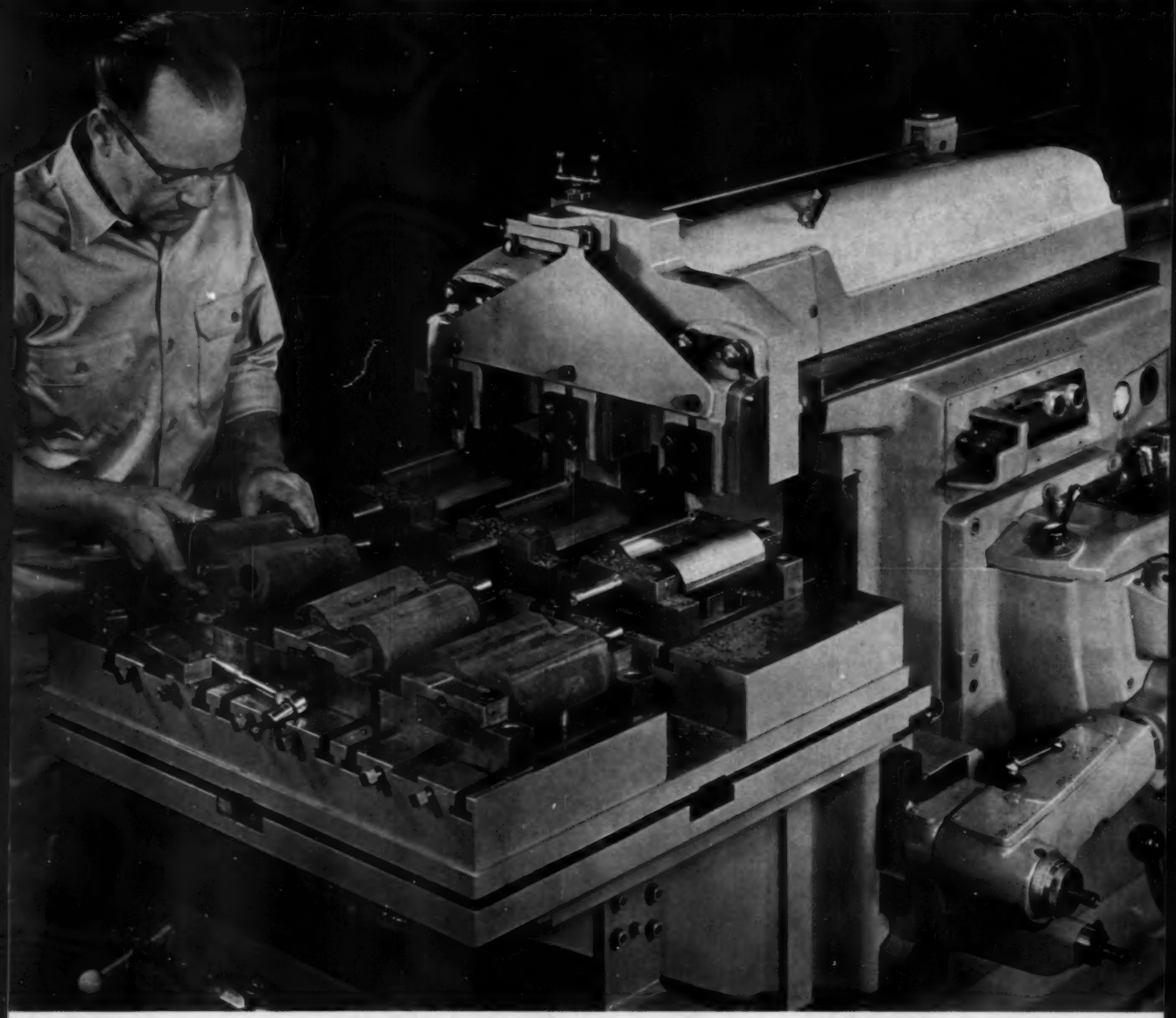
American Machinist

DECEMBER 1, 1958 75¢

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

"and must be round within..."

SYMPOSIUM ON A BASIC PROBLEM, page 109



Three-headed shaper cuts machining time from 18 to 4 minutes—see page 2

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it's mainly a matter of TIMING!

When an old machine costs you more than it earns, replacement pays for itself!

There comes a time in the life of any machine, when it will no longer produce at a profit – a time beyond which its continued use represents a *financial loss* to your company. This point of obsolescence may be the result of physical aging or of technological advances. In either case, the result is the same – money wasted that could be *saved* by the investment in a new machine.

Determining *when* to replace a machine is too important for guesswork or rule-of-thumb computations. Only precise methods of comparative cost analysis will give you the right answer. Our sales engineers are well experienced in making obsolescence studies and will be glad to do the same for you. Similar studies have pointed the way to many important savings.

For Example: A manufacturer of aircraft instruments had been using a 5-year-old precision lathe to perform boring, turning and facing operations on instrument cases. But when this was replaced with a new Heald Model 0 Unit-Type Bore-Matic like that shown at the right, operating costs for the same production were immediately reduced by over 78%. In addition, the elimination of a separate burring operation and reduced assembly time made further important savings, as indicated by the cost analysis below.

	Old Machine	New Machine
Parts per hour	4.3	20
Parts per year (Req'd. Prod.)	10,000	10,000
Direct and Indirect Labor, per year	$20,349	$ 6,055
Scrap Losses, per year	$ 500	$ 300
Annual Maintenance Cost	$ 600	$ 300
Annual Operating Cost	$21,449	$ 6,655
Basic Annual Saving, New Machine		$14,794
Additional Saving from elimination of separate operation		$ 500
Additional Saving from reduced assembly time		$ 1,500
Total Saving Per Year		$16,794
Return on Investment for New Machine		84%

YOU pay for obsolescence. Replacement pays for itself!

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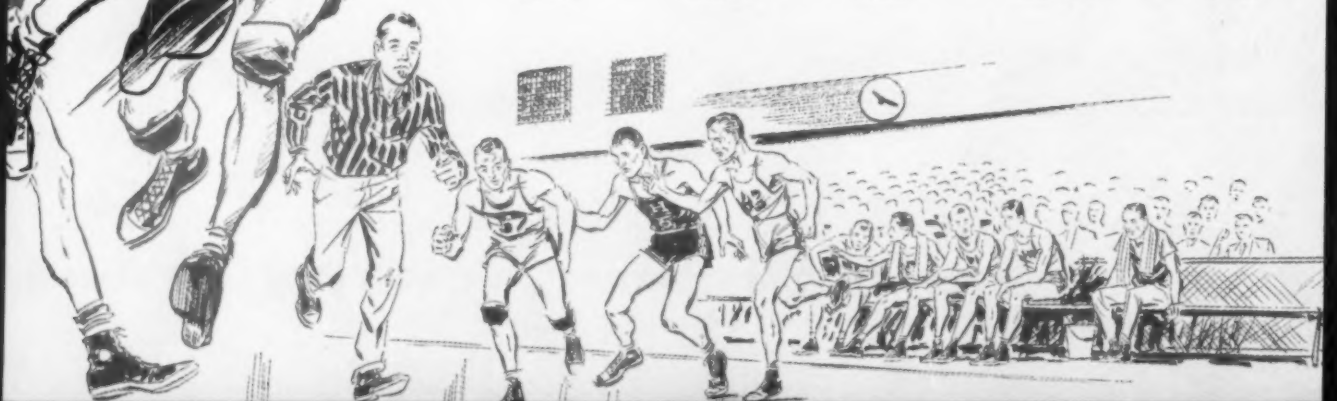

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McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

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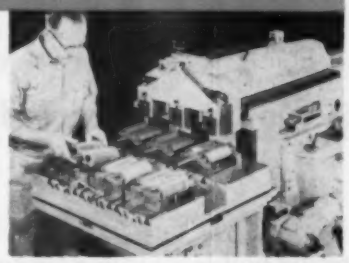

Cover...
Three heads work on three blower impellers on 16-in. Cincinnati Rigid Shaper. Details at left.

Renewed vigor . . . Most production men think of shaping as a process that is declining in importance, unable to compete with modern methods in other processes. That this is not always true is vividly demonstrated by the details of the operation shown on our cover. With a modern machine and imaginative tooling you can do a lot.

Contour of these cast-iron blower impellers was previously done by form milling with cutters that cost $400 to $1200 each, depending on size. (The impellers have three different profiles with a different cutter required for each profile.)

The shaper setup has rise and fall of the worktable controlled by a hydraulic duplicator operating from sheet metal templets costing $40 each. Tools are standard carbide buttons; the only change from one impeller to the other is in the sheet metal templet. The table is rotated by an air cylinder so three pieces can be loaded while three others are being machined. The final surprise is the operating time: 18 minutes per piece (both sides) by milling. 4 minutes by shaping.

When is it round? ... An article contributed by a reader stimulated us to the researches that led to an unusual symposium in this issue. Here you will find a collection of approaches to the basic problem of measuring roundness. The Special Report on page 109 draws its title from the drafting note that often leads to trouble: "and must be round within. . ."

Gathering... Al Peterson at Lockheed doesn't spend all his time on explosive forming. Last issue we were talking about his work on that subject, this time you'll find his report on a new displacement method applied at Lockheed.

Coming... *AM* for December 15 will feature a report on layout of pneumatic control systems. Articles will cover a variety of subjects including a startling development in thread inspection, ideas on optical tooling, and some cost cutting tooling, plus all the regular departments.

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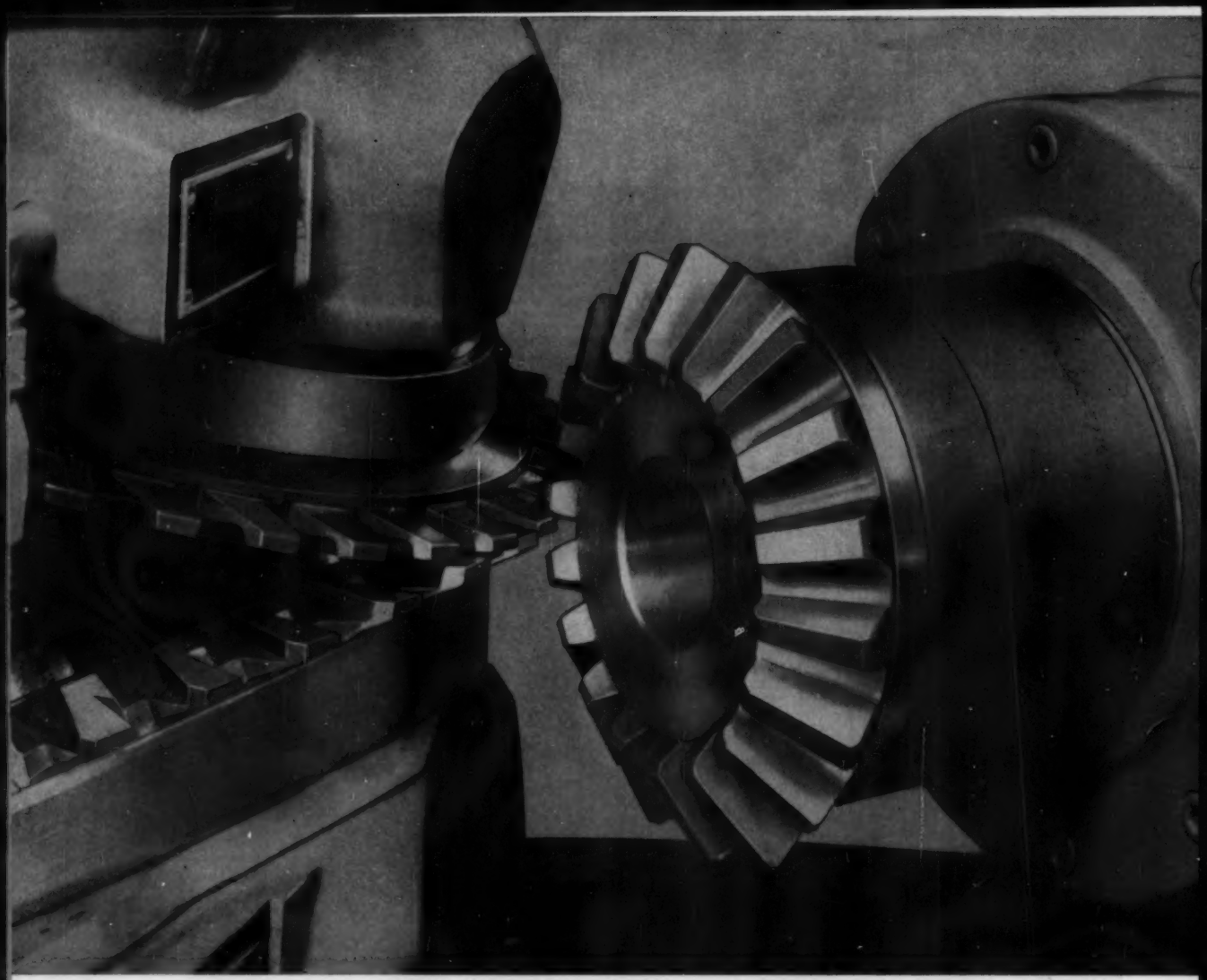

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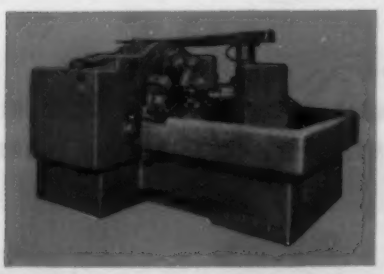

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Cincinnati's automatic infeed grinding cycle and automatic gap eliminator are deciding factors in reducing the cost of grinding precision multiple diameter shafts. A CINCINNATI FILMATIC 10"R x 36" Plain Grinder performs the various operations.

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THE CENTER SECTION

CINCINNATI'S Automatic Features are Additional Time Savers

Multiple diameter shafts and multiple operations are often inseparable. The shafts being ground on the CINCINNATI FILMATIC 10"R Plain at the left are typical examples. They require three types of setups: straight traverse, taper traverse, and infeed. The center section is the infeed operation, with a 4" wide wheel. Two automatic features control cycle time:

1) **push-button automatic infeed**

2) **automatic gap eliminator**

The latter feature automatically compensates for variations in stock allowances. ¶ Traverse grinding operations are equally low in cost and high in quality. Reasons why include rapid stock removal, a well-known Cincinnati advantage . . . FILMATIC grinding wheel spindle bearings (self-adjusting for every setup) . . . automatic grinding wheel balancing . . . smooth hydraulic table traverse (reverses next to shoulder within .004"). ¶ Many additional advantages are offered by Cincinnati for grinding multiple diameter work, or any other work within the range of the machine. A simple cost analysis . . . your present equipment vs. a new CINCINNATI . . . can be most revealing. Catalogs G-661-1 and G-660-2 will help you in making a comparison. Write for copies. Address Grinding Machine Division, The Cincinnati Milling Machine Co.

CINCINNATI

CINCINNATI FILMATIC 10"R Plain Hydraulic Grinding Machine. Range and sizes listed below.

Size	Between-Center Lengths	Catalog
6"R } 10"L }	18" and 30"	G-660-2
10"R } 14"L }	18", 36", 48" 72" and 96"	G-661-1

Sweet's Machine Tool File contains brief specs.

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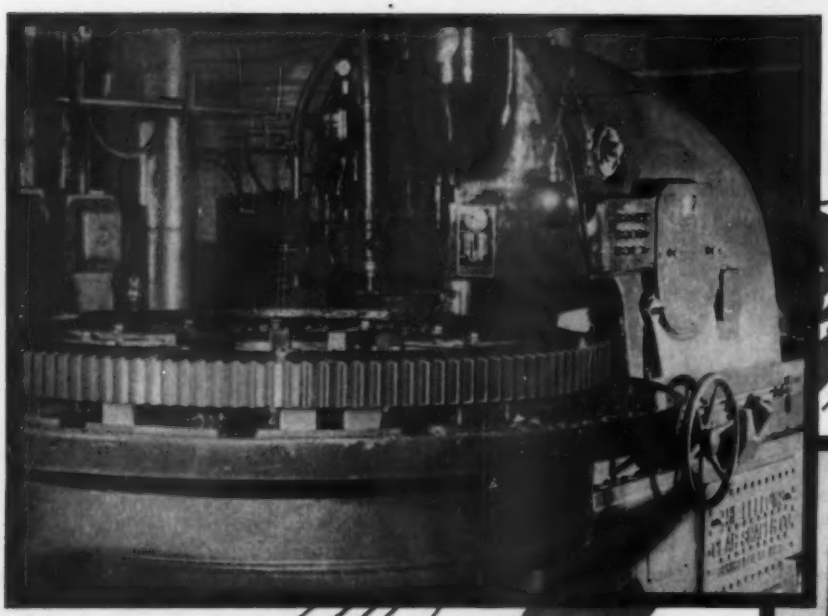

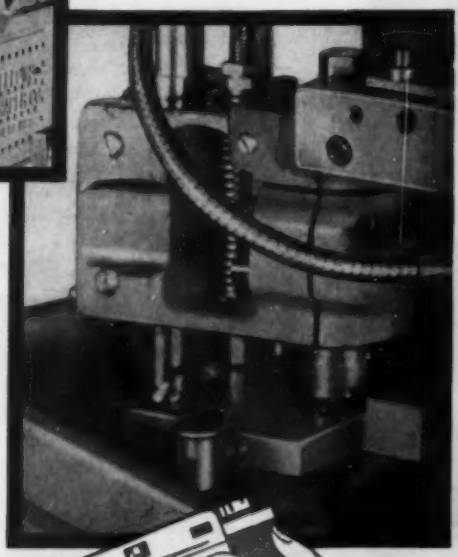

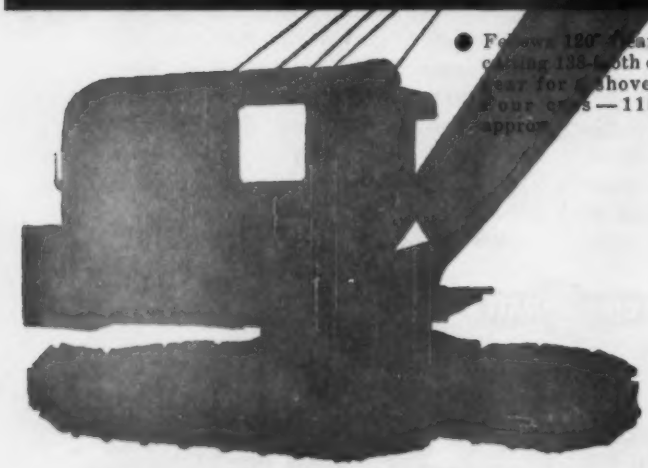

● Fellows 120" Gear Shaper cutting 138-tooth cast steel gear for a shovel-crane. Four cuts—1181 min. approx.

THE PRECISION LINE

Shovel Adjust a Small Camera

For any size gear in the range, new Fellows Gear Shapers lower costs because of their versatility, fast set-up and production speed.

● Fellows 3" Fine-Pitch Gear Shaper cutting 27-tooth, 0.4219" P.D. steel camera gear. One cut—35 seconds, floor to floor.

Whatever capacity you need, from 1/16" to 120" P.D. there's a Fellows Gear Shaper that will pay dividends in lowered production costs. In many plants, new Fellows machines have cut unit costs by more than a third and repaid the original investment in a very few years.

In every size range, new Gear Shapers speed set-ups and change-overs, increase production flexibility as well as cutting speeds and feeds. Rigid construction makes it possible to hold close tolerances on internal and external spurs, helicals and herringbones, as well as on an almost unlimited variety of cams, splines and other non-involute shapes.

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7/16" 20 pitch UNF threads were cut to Class 3 fit from 316 stainless steel by a 7LLL Head mounted on a six-spindle Warner & Swasey Bar Automatic. 144 pieces per hour were threaded 5/16" long within 3/32" of a shoulder at 19 to 20 SFM. 4500 pieces were produced between chaser grinds using 30° short throat chasers.

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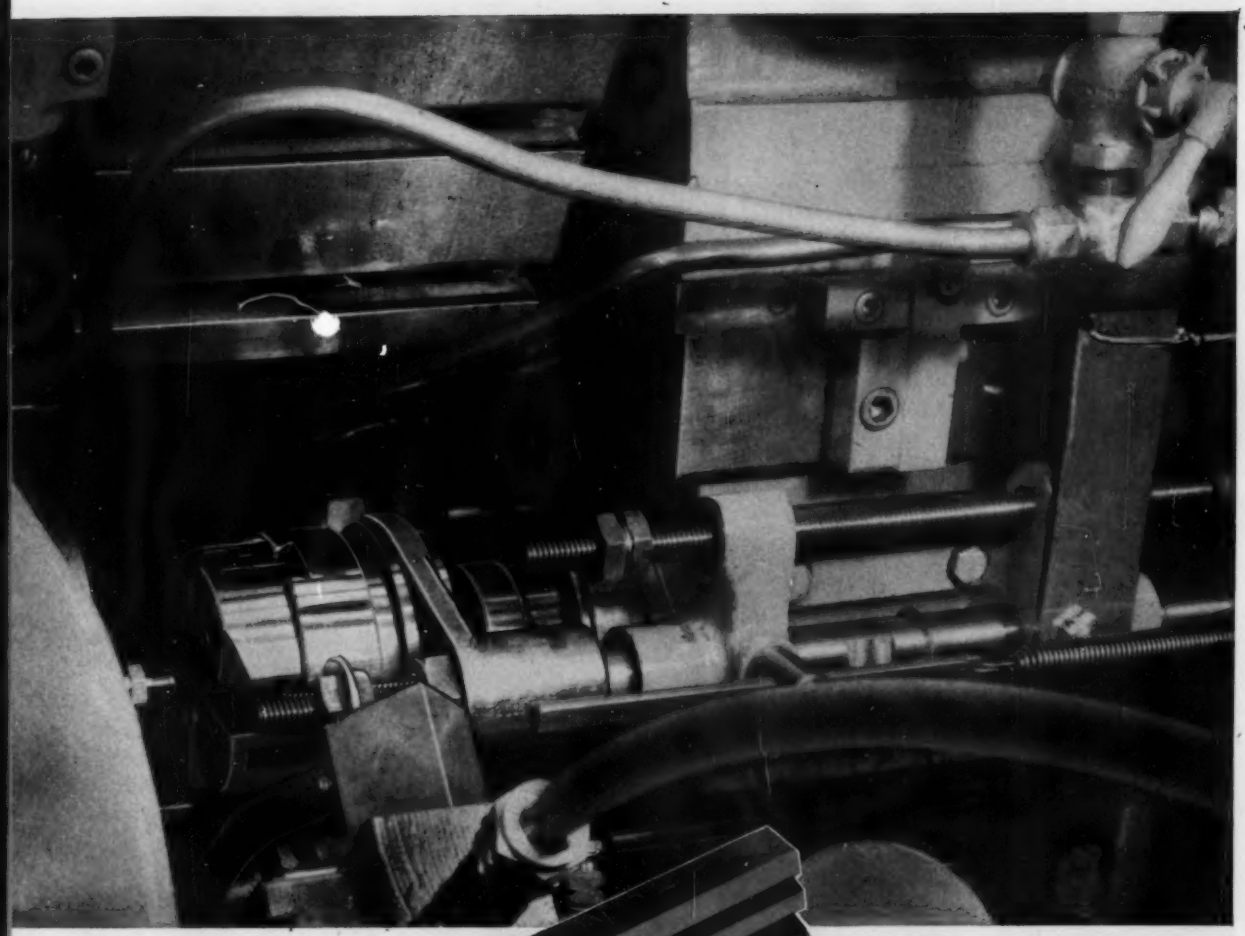
LANDEX Hardened and Ground Heads are unmatched for precision threading and true economy on bar automatics and other live-spindle machines with limited clearance. Let us show you how to improve threading operations—send specifications and ask for Bulletin F-80.



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toolrooms and small lot production

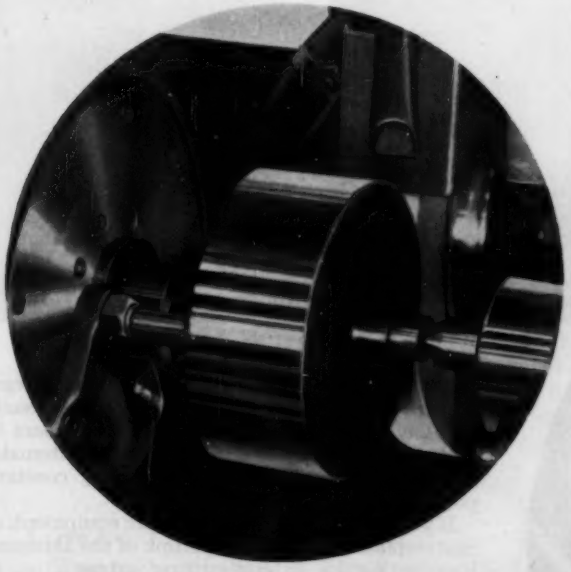
quick setups / hydraulic feeds

traverse grinding
infeed grinding
taper grinding
internal grinding
face grinding

condensed specifications

Maximum work swing	10¾"
Length between centers	24"
Diam. standard grinding wheel	12"
Wheel drive motor	1½ hp.
Work speed range	55 to 495 r.p.m.
Net weight, including elec. equip.	5,700 lbs.

Time saving internal grinding fixture of swinging bracket type gives quick changeover, from external to internal grinding.



Rigid construction gives fine finishes. Roll above was ground to 2 microinch finish.

Quick setup and operator convenience are assured through grouped controls at operator's position.

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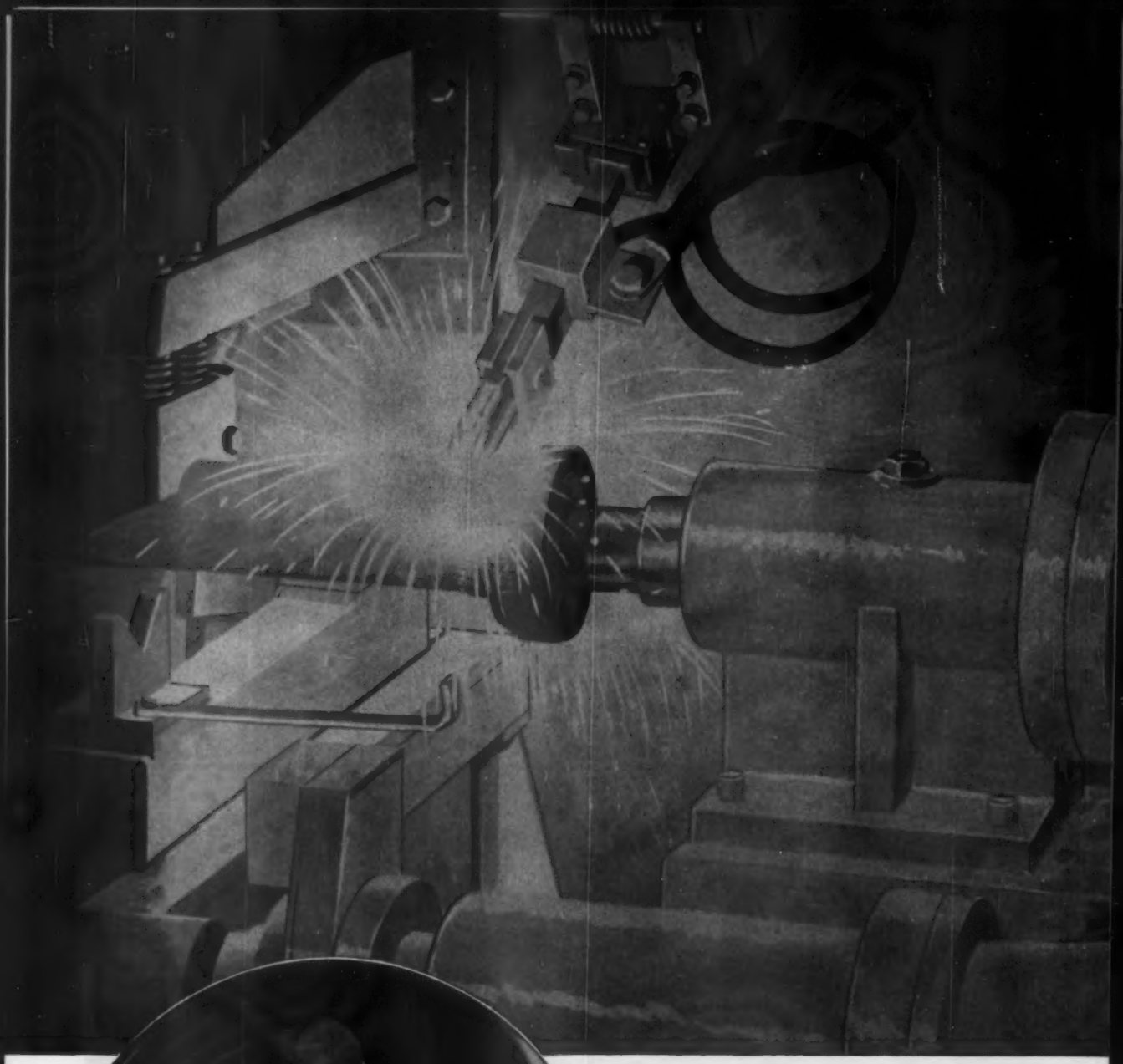

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Henry B. Lust (circles)
CIrcle 6-1748
Manhattan Brass & Copper Co.
WOrth 6-1200
Whitehead Metal Products Co., Inc.
WAtkins 4-1500
Rochester
Brace-Mueller-Huntley, Inc.
COngress 6-6560
Metal Supply, Inc. ... LOcust 2-4260
Sachs Metal Supply Co.
FAirview 8-1710
Syracuse
Brace-Mueller-Huntley, Inc.
HOward 3-3341
Whitehead Metal Products Co., Inc.
GRanite 4-4641

NORTH CAROLINA
Charlotte
Edgcomb Steel Co., FRanklin 5-3361

OHIO
Cincinnati
Central Steel & Wire Company
AVon 1-2230
Williams & Co., Inc... CApitol 1-3000
Cleveland
A. M. Castle & Co., Nottingham Steel & Aluminum Division
ATlantic 1-5100
Williams & Co., Inc. ... UTah 1-5000
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Ohio Metal & Manufacturing Co.
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Toledo
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Metal Goods Corp. ... GIbson 7-4101

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Pacific Metal Co. ... CApitol 7-0693

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Edgcomb Steel Co., GArfield 3-6300
Metal Supply Co., STevenson 7-0220
Whitehead Metal Products Co., Inc.
BAldwin 9-2323
Pittsburgh
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Edgcomb Steel Co. ... 47-1411

RHODE ISLAND
Slatersville
Edgcomb Steel of New England, Inc.
POplar 7-0900

SOUTH CAROLINA
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The J. M. Tull Metal & Supply Co., Inc. ... CEdar 3-8366

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Memphis
Metal Goods Corp., WHitehall 8-3407

TEXAS
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Metal Goods Corp. ... FAirfax 3-0141

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Salt Lake City
Pacific Metals Company, Ltd.
DAvis 2-3461

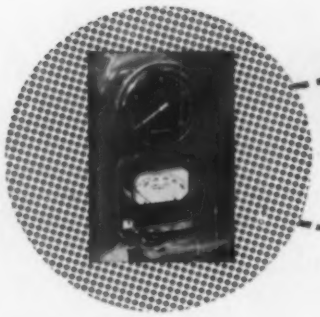
WASHINGTON
Seattle
Pacific Metal Co. ... MAin 2-6925

WISCONSIN
Milwaukee
Central Steel & Wire Company
HUmboldt 1-5000
Steel Sales Co. of Wisconsin
Hilltop 2-2020

Aluminum Products—Hawaii, Honolulu 14, HAWAII

Aluminum Company of America, 956-M Alcoa Building, Pittsburgh 19, Pennsylvania

Some day every good lathe will feature



CONSTANT SURFACE CUTTING SPEED

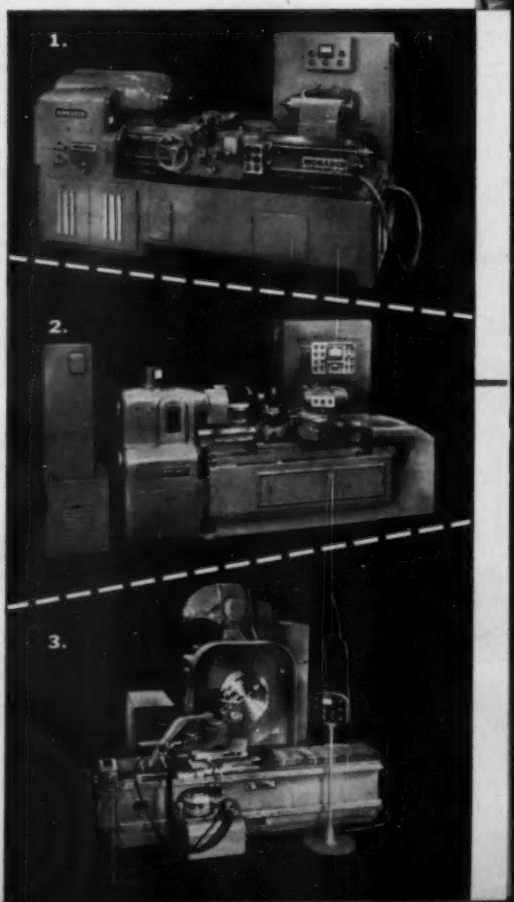
These Monarch Lathes have it now!

Monarch Series EE—Model 1000, **1.**

Monarch Model 21 Monamatic. **2.**

Monarch Right Angle Lathe—Model F. **3.**

Series 61 Engine and Toolmaker's, Models M, N and NN Heavy Duty } **On special order**

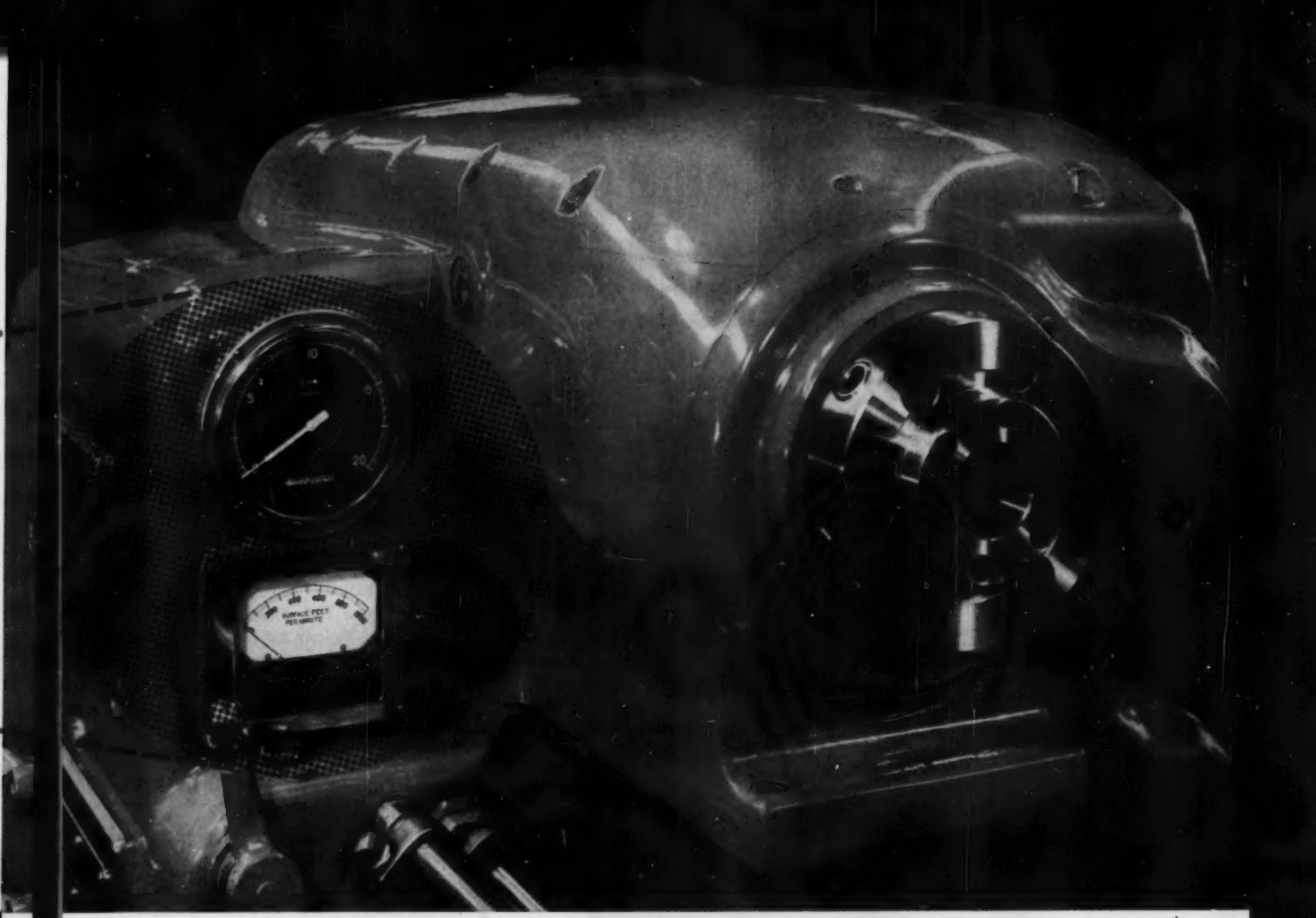


Why buy obsolescence? Why buy a lathe that cut after cut, day after day can't deliver the full metal removing capacity built into it? Why buy anything less than optimum turning for today and tomorrow, both? Why buy less than Monarch?

There are plenty of reasons why you can bet on Constant Surface Cutting Speed. You've got your machine at full load throughout the cycle, increasing output from 30 to 40% on production shaft work—more on facing cuts and forgings. You're getting up to 50% more tool life, avoiding both the tool life loss of excessive speeds and the tool breakage and work distortion resulting from the increased tool forces caused by low speeds. And naturally, you get better finish and reduced power requirements.

Constant Surface Cutting Speed is the coming thing by all the laws of common sense and economics! Buy it now—buy it ahead—with Monarch . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

CIRCLE 184 READER SERVICE CARD



Monarch

ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

MONARCH DYNA-SHIFT LATHES

While Dyna-Shift construction does not provide Constant Surface Cutting Speed as such, it's a close approach to such an ideal—with less initial investment. Surface speeds are selected—or preselected—by dial. There is a much greater range and number of speeds. Speed shift is a matter of seconds and it's both automatic and foolproof. Look into the Dyna-Shift—with the headstock that thinks!

CIRCLE 185 READER SERVICE CARD

Monarch Series 62 Preselector Dyna-Shift

Monarch Series 80 Heavy Duty Dyna-Shift

Monarch Series 90 Heavy Duty Dyna-Shift

Now—FINISH FLAT

New Norton 6" x 18" Surface Grinder Ready For Immediate Delivery

You FINISH FLAT FASTER with the new Type S-3 hydraulic which is equally efficient for long production runs or a wide variety of toolroom grinding because of its new cost-cutting features. It produces plane surfaces smoothly — with automatic or manual cross feed and with such fast, cool-running action that it saves time and money on every job.

Ask your Norton Representative for the whole story. Or write us direct for Catalog 2128. And remember: only Norton Company offers you such long experience in both grinding machines and grinding wheels to bring the "Touch of Gold" that helps you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.

Profit from these benefits

1. Get Jobs Done Fast and Cool — high table speed, *125 feet per minute, maximum.* **2. Handle Tall Work Pieces** — greater vertical capacity, *15"*. **3. Get Lasting Accuracy** with guide-rail cross slide construction. **4. Control Vertical Feed Accurately and Position Fast** with two-speed .0001" increment hand wheel. **5. Benefit from Better Sighting and Loading** due to contoured splash guards. **6. True Forms, Even on Worn Wheels** because of recessed wheel spindle housing.

To Economize, Modernize with **NEW**

NORTON

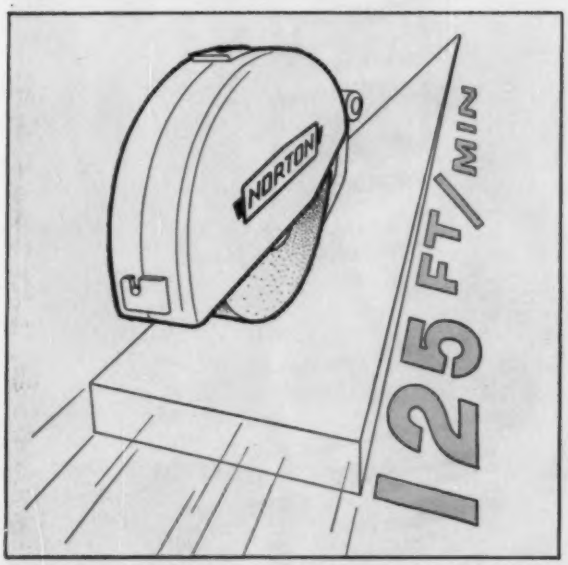
GRINDERS and LAPPERS

Making better products... to make your products better

NORTON PRODUCTS
Abrasives • Grinding Wheels • Grinding Machines
Refractories • Electrochemicals
BEHR-MANNING DIVISION
Coated Abrasives • Sharpening Stones
Pressure-Sensitive Tapes
District Offices
Worcester • Hartford • Cleveland • Chicago • Detroit
In Canada: J. K. Ryder Machinery Co., Ltd., Toronto 8

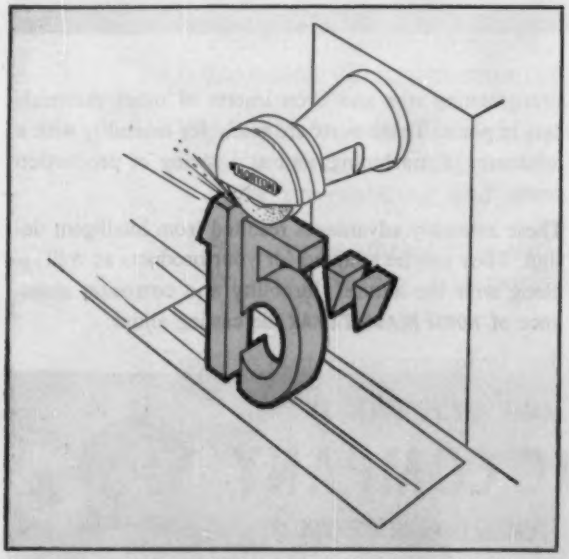
FASTER.... at lower cost

These and many other new features make this machine a "must" for your surface grinding jobs.

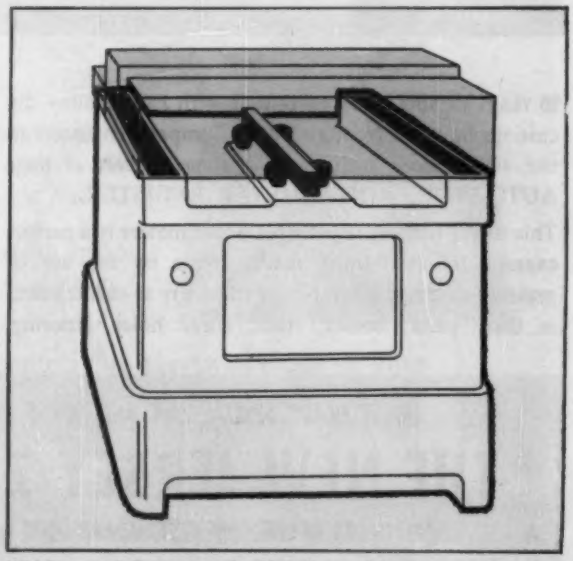


Finish flat faster, cut grinding time and increase production, with high table speed, 125 feet per minute.

Heat goes off in the chips, due to new, high table speed. This cooler grinding permits faster production on heat-sensitive metals.



Handle taller work pieces with high-grind wheel head construction. The vertical capacity from the table top to the bottom of standard full size 8" diameter grinding wheel is 15"



Widely spaced, flat ways and guide-rail cross slide design maintain cross feed accuracy, providing lastingly accurate grinding of shoulders or parallel surfaces.

FOR Accurate Parts and Faster Assembly

ZINC DIE CASTINGS ARE BEST

20 YEARS OF SUCCESSFUL EXPERIENCE with ***ZAMAK*** alloy die castings have led Neptune Meter Company engineers to use 40 or more such parts in some models of their AUTO-STOP PRINT-O-METER REGISTER.

This direct-reading register for liquid meters is a perfect example of complexity made simple by the use of pressure-cast zinc alloy. Notice the many as-cast features in these parts: bosses, studs, cored holes, lettering, strengthening ribs and even inserts of other materials cast in place. These parts are ready for assembly with a minimum of machining, and at a saving of production costs.

These assembly advantages resulted from intelligent design. They can be adapted for your products as well — along with the natural durability and corrosion resistance of ***HORSE HEAD® ZAMAK*** die casting alloys.

HORSE HEAD® SPECIAL ZINC AND HORSE HEAD ZAMAK ARE PRODUCED BY

THE NEW JERSEY ZINC COMPANY

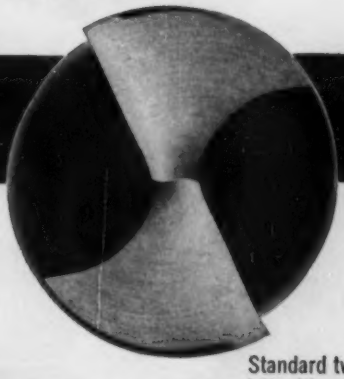
DEVELOPERS OF THE ONLY STANDARD ZINC DIE CASTING ALLOYS IN USE TODAY

160 Front Street · New York 38, N. Y.

HORSE HEAD PRODUCTS ®

FIRST MAJOR DRILLING IMPROVEMENT IN 100 YEARS!

. . . a Product of
CINCINNATI RESEARCH



Standard twist drill with spiral point geometry.

"Spiral point", Cincinnati's new concept in drill point geometry, provides cost-reducing opportunities in your drilling operations.

Produces more precision holes per drill grind.

Produces rounder, straighter, on-size holes . . . frequently eliminates reaming.

Maintains hole-positioning accuracy with its self-centering drilling action . . . often eliminates pre-centering and costly guide fixtures.

Requires less thrust force with resulting greater drilling accuracy, less workpiece distortion.

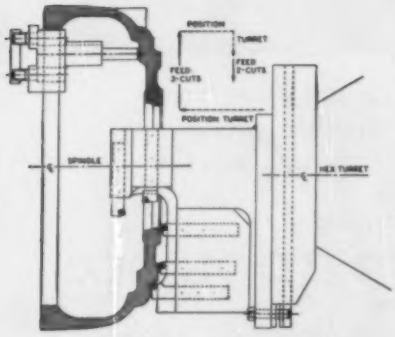
Put this cost-reducing spiral point geometry on the twist drills in your plant with the SPIROPOINT Drill Sharpener, another precision product of Cincinnati Research. Write today for technical bulletin.

Improved Machining Through Research

CINCINNATI LATHE AND TOOL CO.

3206 Disney Street • Cincinnati 9, Ohio

"TRAY-TOP" Lathes / "CINCINNATI" Drilling Machines / "SPIROPOINT" Drill Sharpeners

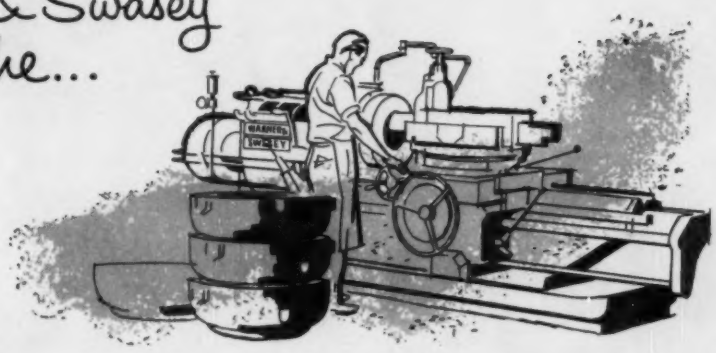


Five cuts with only two machine settings are accomplished with simple multiple tooling and the four-way feeding motion of the cross sliding hexagon turret. (In this station only the "in-and-out" cross feeds are used.) Note the unique tool block adapters mounted on the hex turret. They permit "pre-set" cutter blocks to be quickly and accurately positioned—allow a wide range of similar parts to be machined in small lots with a minimum of setup time—and provide a high degree of interchangeability between setups on the same machine or from one machine to another. General use of "throw-away tips" keeps downtime for cutter replacement to a minimum.

At left: Schematic diagram of above operation shows multiple cutter block tool layout, turret positioning and feed direction, and holding method for the turbine housing.

CIRCLE 190 READER SERVICE CARD

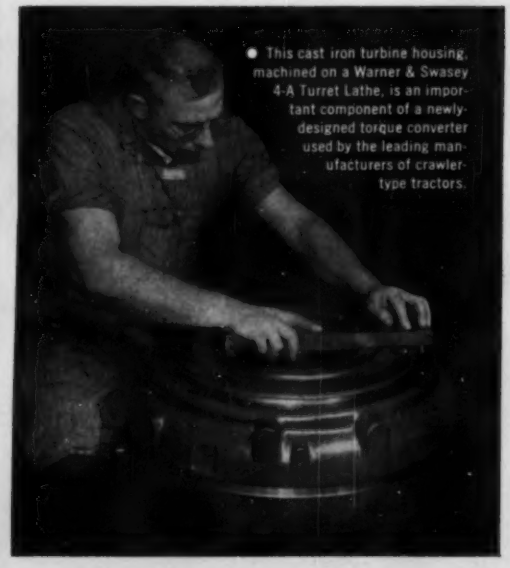
On this Warner & Swasey 4-A Turret Lathe...



FOUR-WAY FEEDING MOTION

of Cross Sliding Hexagon Turret

- **PERMITS SIMPLER MULTIPLE TOOLING—GREATER FLEXIBILITY**
- **REDUCES BOTH MACHINE HANDLING AND CUTTING TIME**



● This cast iron turbine housing, machined on a Warner & Swasey 4-A Turret Lathe, is an important component of a newly-designed torque converter used by the leading manufacturers of crawler-type tractors.

Machine handling operations were cut in half—from 14 to only 7—in the production of these complex 26½" diameter turbine housings. In addition, the efficient utilization of the simpler "multiple-cut" turret tooling by the versatile four-way feeding motion of the cross sliding hexagon turret made significant reductions in cutting time.

As a result, floor-to-floor time was reduced 28%—from 41.7 to 30.0 minutes. This work was formerly run on vertical and "fixed-center" turret lathes.

Handled in 100-piece lots on their two new Warner & Swasey 4-A Saddle Type Turret Lathes, bore tolerances of .002-inch total are easily held along with concentricities of .005-inch T.I.R.

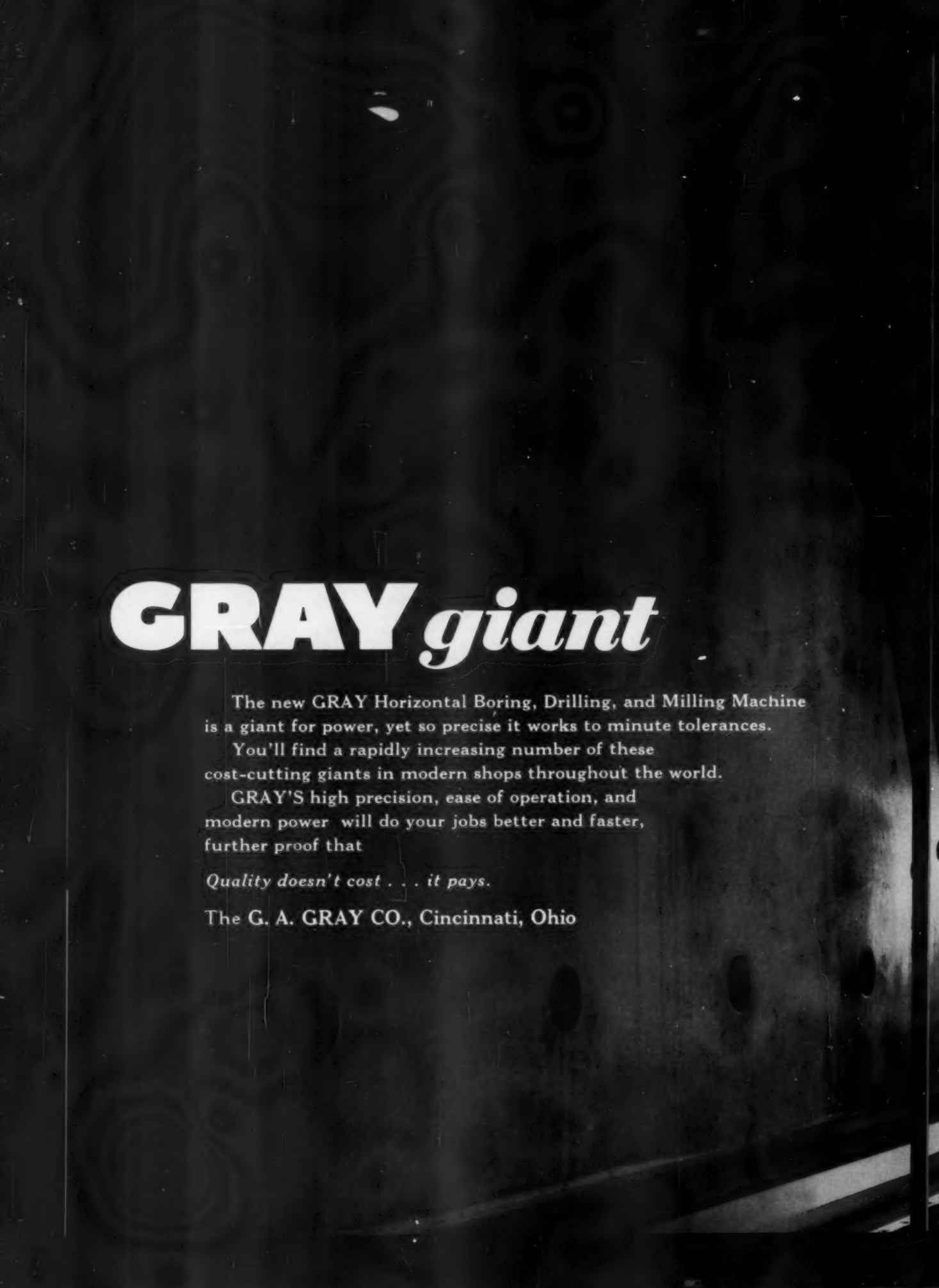
Note these cost-cutting advantages of the cross sliding hexagon turret attachment:

1. *Simpler, less expensive tooling accomplishes special purpose tool results on complex parts.*
2. *Provides the reach necessary for turning, multiple facing and boring a full range of large diameters, including deep bores, back faces, recesses and tapers.*
3. *Lower setup time—hence small lots are practical.*
4. *Versatility—can be inexpensively tooled for either volume or small-lot production of large, complex parts. It's also readily adaptable as a fixed-center machine for handling routine turret lathe work.*

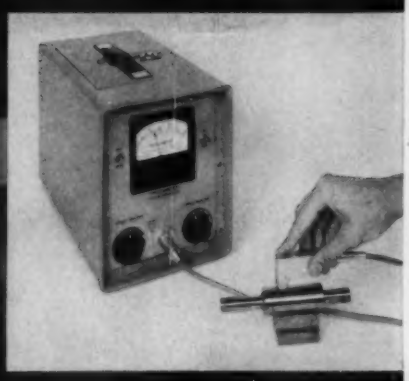
Your Warner & Swasey Field Engineer will gladly present the complete story of how versatile cross sliding hexagon turret equipped Saddle Type Turret Lathes can handle your more complex turning jobs—faster and more economically. Call him today.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY


GRAY giant
The new GRAY Horizontal Boring, Drilling, and Milling Machine is a giant for power, yet so precise it works to minute tolerances.
You'll find a rapidly increasing number of these cost-cutting giants in modern shops throughout the world.
GRAY'S high precision, ease of operation, and modern power will do your jobs better and faster, further proof that
Quality doesn't cost . . . it pays.
The G. A. GRAY CO., Cincinnati, Ohio

Profilometer parts turned on RIVETT 1020S require no rework -save production time!



Profilometer manufactured by Micrometrical Manufacturing Co., Ann Arbor, Michigan.

Rivett 1020S Toolroom Precision Lathe in use in toolroom of Micrometrical Manufacturing Co., Ann Arbor, Michigan.

Micrometrical is famous as a manufacturer of precision instruments, such as the Profilometer, designed to measure surface roughness in millionths. Micrometrical highlights an important Rivett feature in its statement:

"Because of its construction and weight, the Rivett 1020S Lathe has very little vibration, making it ideal for close tolerance work.

In time of need, during peak work loads, the Rivett is often used on short-run production work, especially on intricate and complicated parts requiring extremely fine finishes as measured with the Profilometer."

RIVETT

"Steelway" Lathes

Inquire about the 1020S Toolroom Precision Lathe now. Write for 16 page catalog and the name of your nearest dealer.

RIVETT LATHE & GRINDER, Inc.

Dept. AM-12, Brighton 35, Boston, Mass.

921-T-*DC*

ALUMINUM TOOLING PLATE

DIRECT CHILLED

FOR *Greater Density, Less Porosity and Improved Stability*

TO INSURE:

1. EASIER MACHINABILITY
2. PRECISE DIMENSIONS
3. SUPERIOR FLATNESS
4. BETTER SURFACE FINISH
5. LOWER COST TOOLING

These five outstanding advantages are possible because, starting with a finer grain structure and an inherent stability not approached in any other lightweight tooling material, each 921-T-*DC* tooling plate is machine finished to exact dimensions before shipment.

Not only is 921-T-*DC* being used by leading airframe, automobile, appliance and other metal working industries for jigs, fixtures and production tools, but is finding acceptance for use in the manufacture of precision equipment and components where close tolerances, uniformity and stability are prime requirements.

GET THE FULL STORY

• • • A complete description of Pioneer 921-T-DC; its versatility and adaptability; illustrations of applications, are contained in a new brochure available without cost or obligation through any of the Pioneer distributors listed below.

SPECIFY PIONEER 921-T AND ORDER FROM THESE METAL SUPPLIERS

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Subsidiary of Morris P. Kirk & Son, Inc.
Pacific Coast Unit of National Lead Company

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DENVER, COLO.: ABC Metals Corporation
DETROIT, MICH.: Kaole Steel & Aluminum
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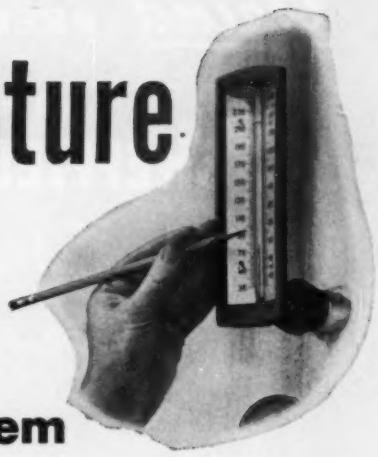
WORLD'S LARGEST DISTRIBUTOR OF AIRCRAFT EXTRUSIONS / MORE THAN 2,500,000 POUNDS IN OVER 7,000 SHAPES

Read the Temperature and SAVE!



New Cold Bonderite System Cuts Heat Costs Up to 70%

The temperature gauges on the input lines of a typical Cold Bonderite System installation tell the story. 40° to 75° cooler in cleaner, rinse and Bonderite than in the conventional hot phosphating installation.

And all that heat saved translates into dollars saved, because chemical costs are comparable, as is the effective protection of the coatings produced.

Salt spray tests show effectiveness of coatings produced by Cold Bonderite System.

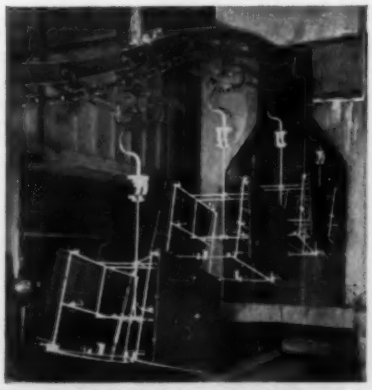
This is a thoroughly tested and proven system. The Cold Bonderite System is in use right now in many plants in many industries. And more are changing to it as they hear about the spectacular savings.

- A large automotive plant reports savings at the rate of 40 carloads of coal per year.
- An appliance manufacturer says the Cold Bonderite System is saving 5¢ per cabinet.
- Another manufacturer shut down one of his boilers because of reduced heat requirements.
- An automotive plant is saving about 12¢ per body.

There are other operational savings besides heat when you use the Cold Bonderite System. You'll use about 25% less water. You'll save electricity because you won't need to run an exhaust fan. You'll save on maintenance. You'll cut down-time, since there's no waiting for cool-off should service be required.

There are so many benefits and advantages to the new Cold Bonderite System that you can't afford not to investigate it for *your* plant.

Call or write today!



Parker quality and Parker dependability mean that your production lines will roll steadily and efficiently.

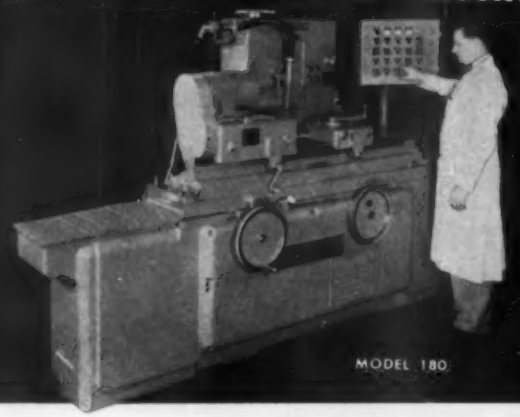
PARKER RUST PROOF COMPANY
2196 E. Milwaukee, Detroit 11, Michigan
Tel: TRinity 5-3377

BONDERITE corrosion resistant paint base	BONDERITE and BONDERLUBE aids in cold forming of metals	PARCO COMPOUND rust resistant	PARCO LUBRITE wear resistant for friction surfaces	TROFICAL heavy duty maintenance paints since 1883

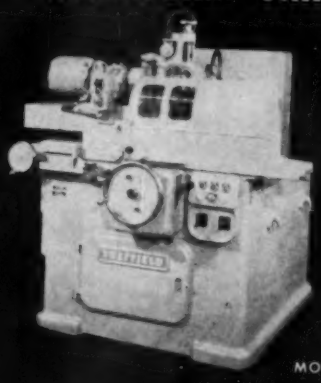
Since 1914—leader in the field

*Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

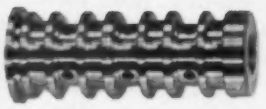
Grind PRECISION FORMS, GROOVES and LANDS *in Record Time* with SHEFFIELD'S CRUSHTRUE MULTIFORM GRINDERS

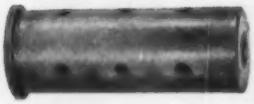


MODEL 180



MODEL 109



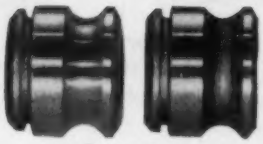


Servo Mechanism Sleeve

The seven grooves of this servo mechanism sleeve are crushtrue ground from the solid to a tolerance of .001" on spacing and .002" on minor diameter in 55 seconds. Material, SAE 52-100; Rockwell, 58-60 C; depth of plunge grind, .145".

Forms and grooves are precision ground on these machines with comparable speed and economy.

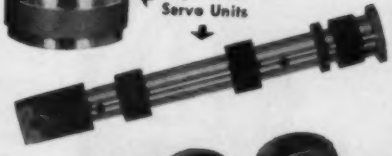
For complete details write to Department 1, The Sheffield Corporation, Dayton 1, Ohio, U.S.A.



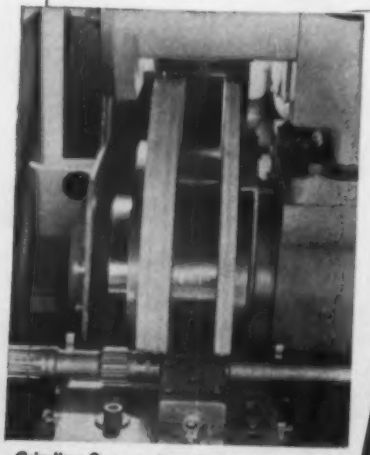
Bearing Race

Aircraft Servo Component

Hydraulic Servo Units



Self-aligning Bearings



Grinding Grooves in a Transmission Shaft

Crushtrue Roll

8071

the **SHEFFIELD** *corporation*

of Bendix Aviation

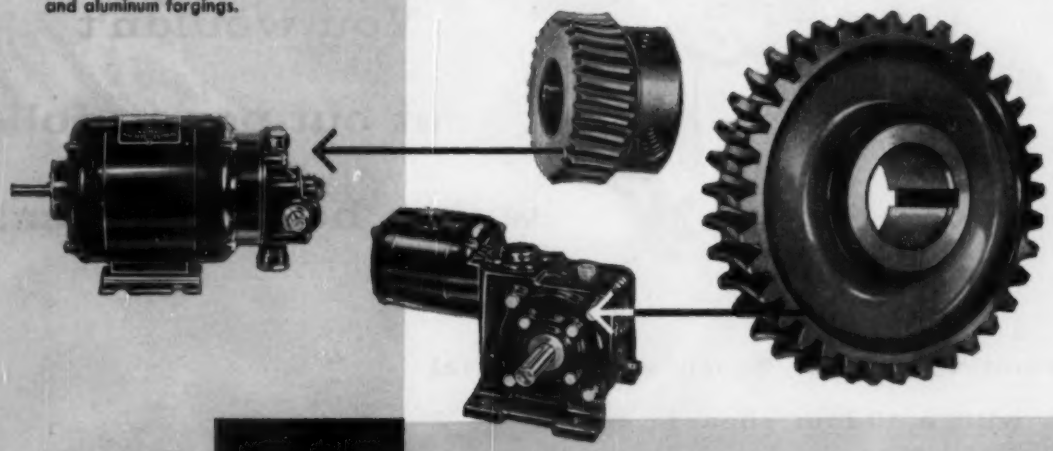
manufacture and measurement for mankind

MUELLER BRASS CO. forged gears improve dependability and performance of BODINE electric motors

For combined high shear strength and maximum wear life in their single and double reduction speed reducer motors, Bodine Electric Company of Chicago uses gears forged from Mueller Brass Co. 603 Alloy.

Bodine has specified Mueller Brass Co. forged gear blanks because of their consistently high quality . . . there is no porosity, foreign inclusions or defects typical of cast blanks. The hot working of the metal followed by heat treatment to the desired physical properties produces a refined grain structure to give uniform machining and wear in service. The forged blanks are consistent in size and held to close tolerances. Bodine has also found that the excellent machinability of the blanks in the hobbing operation increases overall hob life.

For forgings of high tensile strength, high density, minimum porosity, light weight, corrosion resistance, good machinability and low costs with little scrap loss, it pays to specify forgings from the Mueller Brass Co., the world's largest producer of brass, bronze and aluminum forgings.



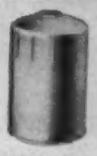
only the man from Mueller Brass Co.

can offer unbiased advice on the "one best way" of producing your parts, because Mueller Brass Co. is the only fabricator in the country offering all these methods of production . . . assuring you the best product at the best price . . . made the one best way.

Write today for complete catalogs on any of these products.

FORMED COPPER TUBE

PLASTICS INJECTION MOLDING



COLD-PREST IMPACT EXTRUSIONS

SCREW MACHINE PRODUCTS

POWDER METAL PARTS

RED BRASS CASTINGS

Also producers of: Super Cutting Red Tip Brass Rod • Aluminum Extrusions Aluminum Sheet, Coil and Strip • Plastic Pipe and Fittings • Copper Tube and Solder Type Fittings •

MUELLER BRASS CO. PORT HURON 24, MICHIGAN

242

You wouldn't cut out paper dolls with a hedge clipper!!

Then why shear 6-inch wide material with a 10-foot shear?

Cutting a small piece of light metal, plastic or rubber on a big shear is even more expensive than it is exasperating. Yet many shops, out of necessity, tie up big shears with small work.

That problem is solved by the New Lodge & Shipley 24" Speed Shear. Specially designed for fast cutting of small pieces, it has a capacity of 1/8" x 24" mild steel. Its unique work table is provided with holes which allow fast set-up of guides, templates and protractors for production of straight-side blanks at speeds up to 120 strokes per minute.

A 24" Speed Shear may easily pay for itself merely in freeing a big shear from wasteful small jobs. Investigate its possibilities in your plant. For detailed Bulletin No. PS-12, write: **The Lodge & Shipley Co., 3056 Colerain Ave., Cincinnati 25, Ohio**

Lodge & Shipley

He's equipping this machine with the "Touch of Gold"

Grinding is always a profit-producing step in metal working. That's why the grinding wheel itself is so important — and why Norton world leadership in grinding is important to you when you specify grinding wheels.

Because a Norton wheel, contacting the work in process, is always adding the "Touch of Gold" . . . creating value and usefulness through improving the fit and finish of the product. The right wheel for each job is the key to having each job done right . . . which is the real secret of profitable production. And Norton stocks more than 200,000 types and sizes of grinding wheels to make your "Touch of Gold" quickly available. Plants and distributors all around the world.

NORTON COMPANY, General Offices, Worcester 6, Massachusetts.

NORTON
ABRASIVES

Making better products . . . to make your products better

ARMSTRONG

T-SLOT CLAMP

STEP BLOCK

SET-UP AND HOLD-DOWN TOOLS

ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

NON-SKID BLOCK

Write for Circular

Buy ARMSTRONG TOOLS from your Industrial Distributor

PLANER JACKS

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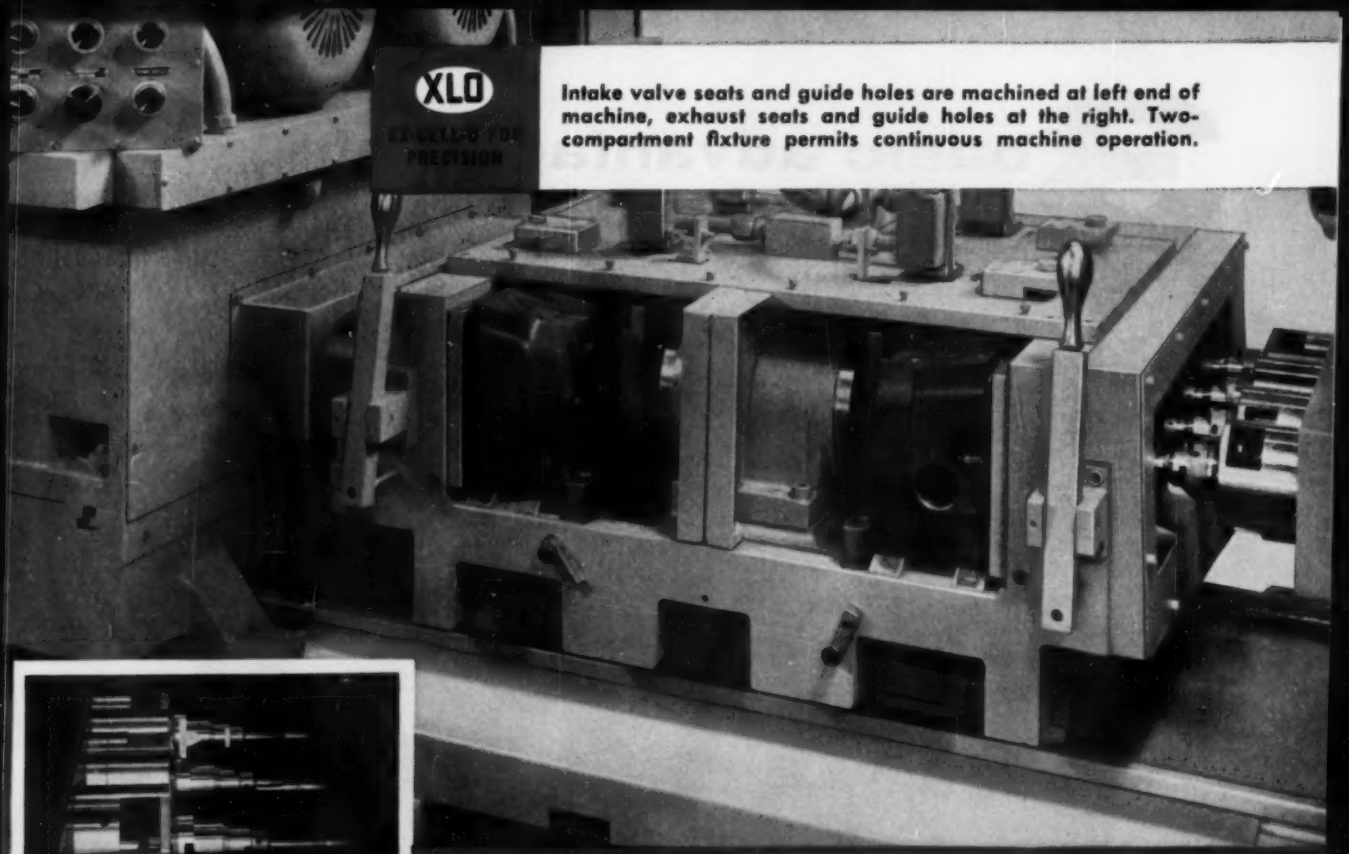
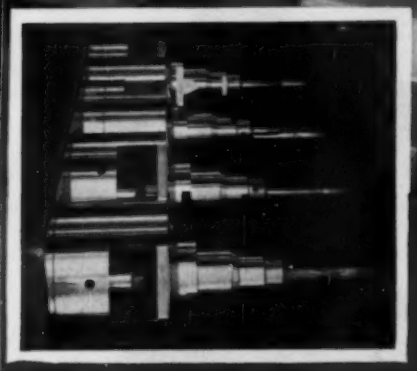
STRAP CLAMPS

ARMSTRONG BROS. TOOL CO.

5215 W. ARMSTRONG AVE. CHICAGO 46, U. S. A.



Intake valve seats and guide holes are machined at left end of machine, exhaust seats and guide holes at the right. Two-compartment fixture permits continuous machine operation.



Gun-type drills extend through spindle centers and retract automatically

CONCENTRICITY GUARANTEED

58-10

Bor-Drils valve guide holes and plunge-faces valve seats in one operation

A Standard Ex-Cell-O 17-A Precision Boring Machine, equipped for the Bor-Dril process, is turning out 23 cylinder heads per hour for a large auto manufacturer.

The table rapid-traverse feeds cylinder heads to the left into four cutters that plunge-face intake valve seats, then retract .020". Next, four gun-type drills advance through the spindle shafts to Bor-Dril guide holes from the solid—with guaranteed concentricity. The table then moves to the right, repeating the process on exhaust valve seats and guide holes.

Find out how the Bor-Dril process can help speed production in your plant; contact your local Ex-Cell-O Representative, or write direct.

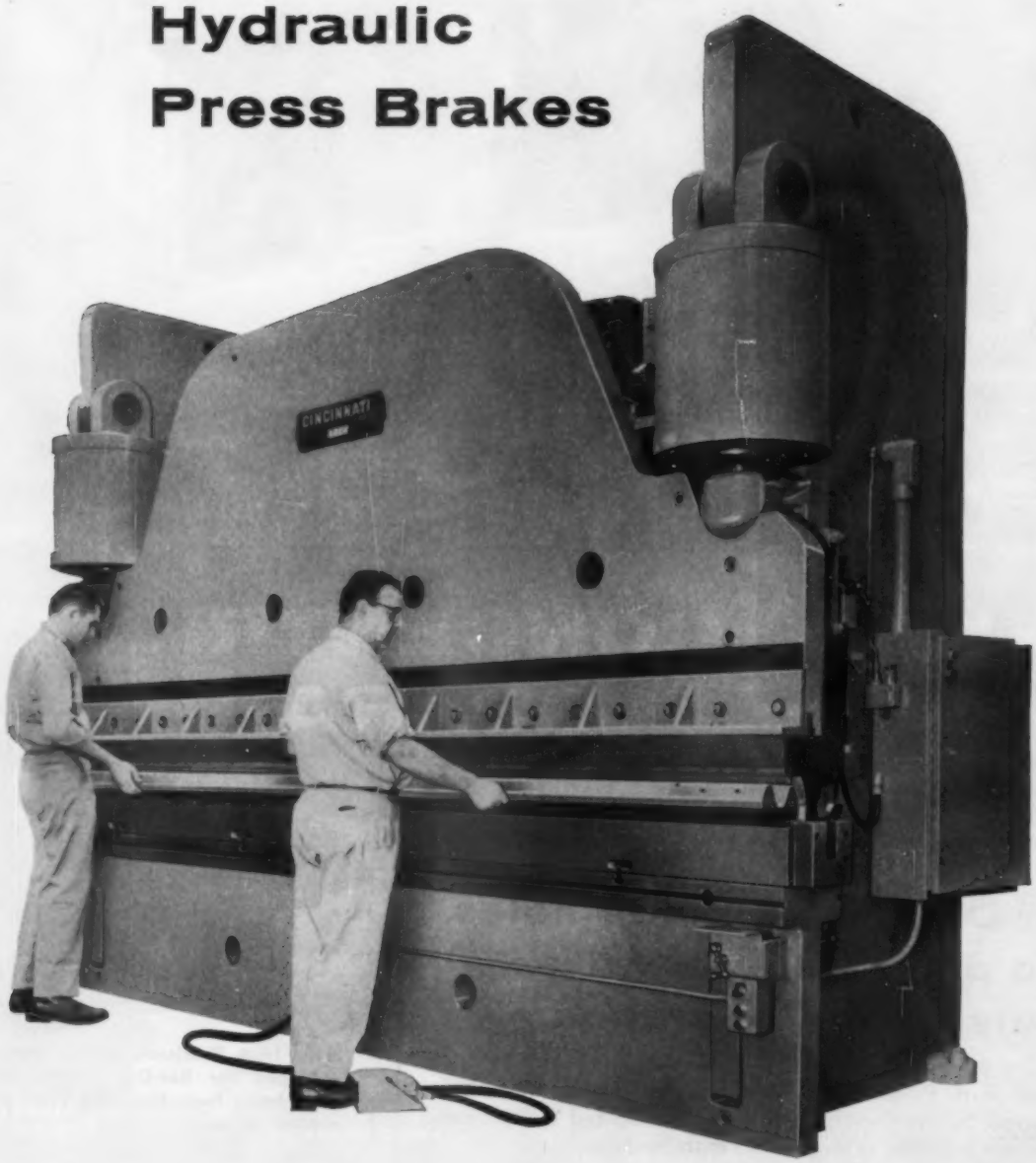
Style 17-A Precision Boring Machine equipped for Bor-Dril process drills deep holes from the solid with guaranteed accuracy.

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

Machinery Division

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

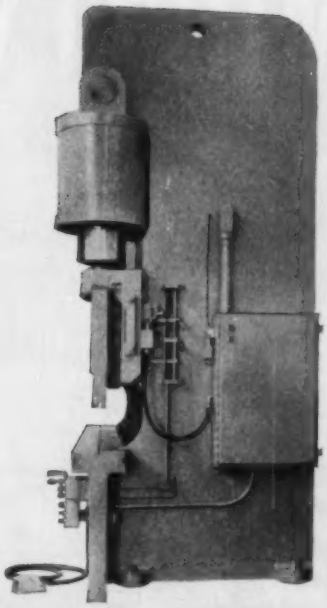
3 basic advantages of CINCINNATI® Hydraulic Press Brakes



Cincinnati® Hydraulic Press Brakes, now available in 300, 400, 500, and 600 ton capacities, are not substitutes for Cincinnati® Mechanical Press Brakes. Where high production, maximum accuracy, and greatly increased tonnage at the bottom of the stroke are required, Cincinnati Mechanical Press Brakes remain unchallenged. However, where accuracy requirements are not extremely critical, where high speed is not necessary and where long strokes are desirable, Cincinnati Hydraulic Press Brakes offer important advantages—some entirely new to the field of hydraulic press brakes.

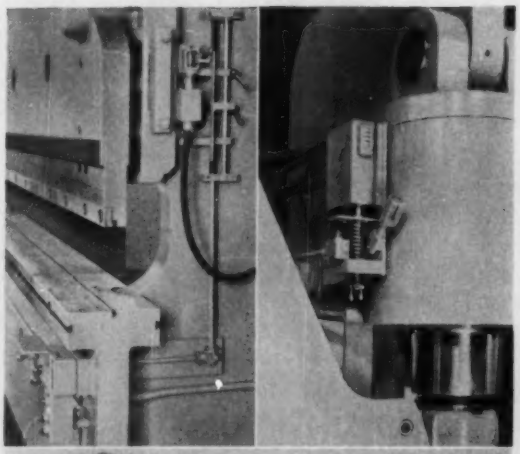
1 Accuracy

A special Cincinnati feature is extra heavy housings which extend above the cylinders, providing a means for their unique clevis mounting. This gives true center-line loading: vertical thrust of the cylinders is carried by the housings *without welds or bolts*. The cylinders are connected to the ram with ball joints and are self-aligning in all directions. Binding of pistons and ram slides cannot occur. In addition, deep beds and rams, and large radii at all stress points minimize deflection and insure maximum accuracy. With Cincinnati interlocked construction, the bed is supported directly by the housings *without* load bearing welds.



2 Convenience

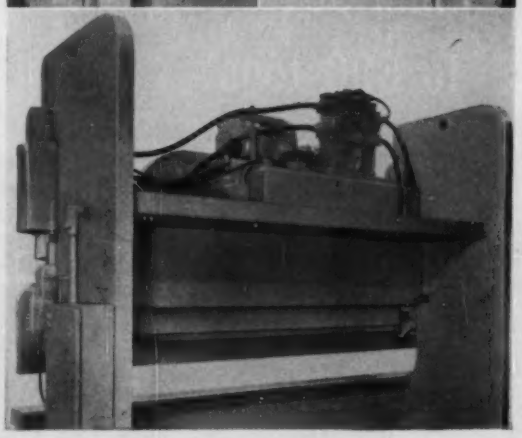
All controls are at right end of the machine, within easy reach of the operator. The bottom stroke-stop adjusting crank is on the front of the bed. Micrometer registers are provided to indicate both the bottom stroke-stop and ram tilt adjustments, a great convenience in setting dies on initial or repeat setups. Tonnage, stroke length, and ram position are easily set. Indicator lights tell direction ram is moving or ready to move. Machine cannot overload: it reverses when loaded to any given tonnage setting.



3 Economy

Greatly simplified maintenance and reduced cost result from Cincinnati's exclusive hydraulic manifold block, which brings valves and piping together in one compact assembly. The usual maze of valves, pipes and fittings is eliminated. High pressure joints are reduced to a minimum, which means important maintenance economies, year after year.

Write Dept. A for informative Bulletin HB-1.



Shapers / Shears / Press Brakes

THE CINCINNATI SHAPER CO. Cincinnati 11, Ohio, U.S.A.

a MIGHTY fine press...

built to withstand rigorous service

From crown to base, Minster S1's are truly MIGHTY presses. You get these features as Standard Construction:

- ★ Box type cast construction for maximum rigidity
- ★ All wear surfaces bronze lined, precision fitted and replaceable
- ★ Minster patented Combination Multiple Disc Air Friction Clutch and Brake
- ★ Exceptional Slide guiding and barrel type adjustment
- ★ Air Counterbalances on slide
- ★ Totally enclosed gears running in oil
- ★ J. I. C. Dimensions

MINSTER
series **S1**
straight side single point presses

for drawing, forming, trimming or blanking.

capacities from 50 to 600 tons

Photo courtesy of Long Manufacturing Division, Borg-Warner Corporation, Detroit, Michigan. Minster S1-500 Press used in production of clutch coverplates for the automotive industry.

THE MINSTER MACHINE COMPANY
Minster, Ohio

MINSTER

ACCO for Better Values

SPEEDY SLING SERVICE with ENGINEERED SAFETY!

ACCOLOY® KUPLEX SLING CHAINS

Quick Service from Distributor's Stock!

• Your nearby ACCO Authorized Sling Chain Distributor now offers a new sling service that saves time and money for you. This is made possible by American Chain's sensational, newly-designed **ACCOLOY KUPLEX Sling Chains.**

SAFE, STRONG, STREAMLINED

These slings are the *latest and greatest development* in sling chains. All parts in each leg are manufactured *exclusively* by American Chain, of the same alloy, and engineered to be as strong as the chain itself. They are of a streamlined design that reduces the possibility of catching or snagging.

Finally the component parts are factory proof-tested to twice the working load limits—your assurance of maximum strength and safety.

Another valuable feature: all parts remain visible for easy, periodic wear inspection.

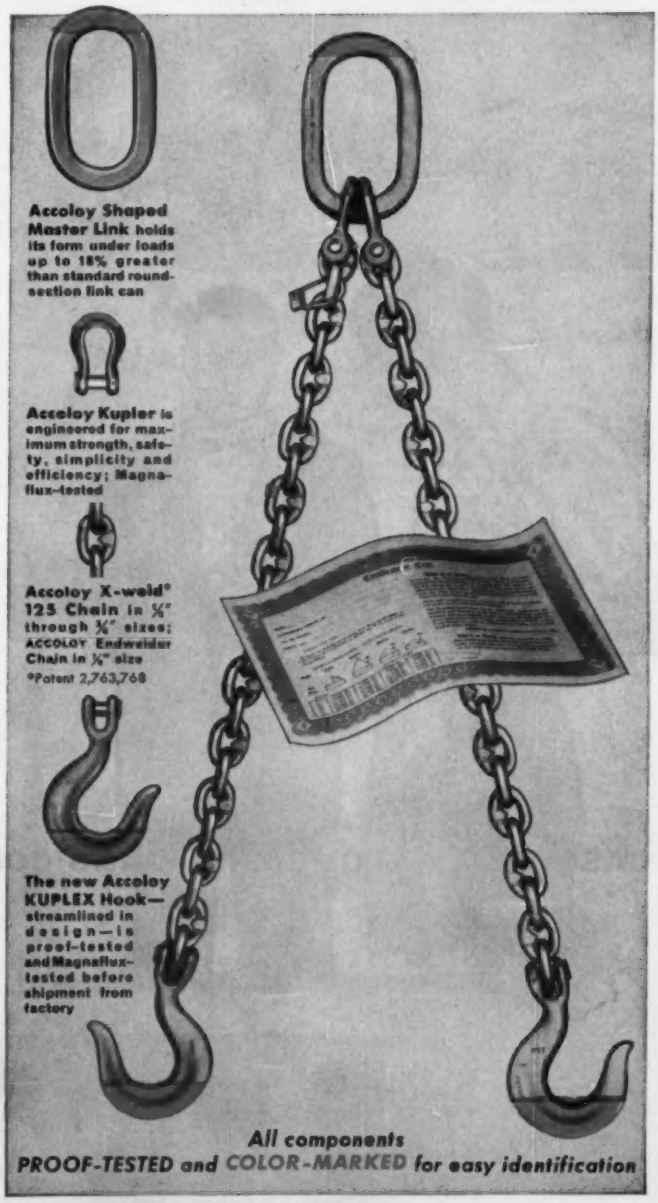
TWO STYLES—SIX SIZES

The new ACCOLOY KUPLEX Sling Chains are available in single-leg and two-leg styles and in six chain sizes, from ¼" through ⅞". All chain is made of Accoloy 125 material. All component parts of each assembly are marked and easily identified as to the size of chain with which they are to be used. Components are *color-marked in* orange for easy identification.

CERTIFICATE OF TEST, issued by ACCO and signed by your Authorized Distributor, is furnished with each sling shipment.

GET THE COMPLETE STORY

You will find it to your advantage to get the full story of ACCOLOY KUPEX Sling Chains. Learn how promptly they can be serviced . . . how easily repairs or parts replacements can be made, should they ever become necessary . . . and how you can benefit from this Great New Distributor Service and this Great New Sling Chain. Write for **Folder DH-39** and name of nearest ACCO Authorized Sling Chain Distributor.


Accoloy Shaped Master Link holds its form under loads up to 18% greater than standard round-section link can
Accoloy Kuplex is engineered for maximum strength, safety, simplicity and efficiency; Magnaflux-tested
Accoloy X-weld* 125 Chain in ¼" through ⅝" sizes; ACCOLOY Endweldur Chain in ½" size
*Patent 2,763,768
The new Accoloy KUPLEX Hook—streamlined in design—is proof-tested and Magnaflux-tested before shipment from factory
All components
PROOF-TESTED and COLOR-MARKED for easy identification

American Chain Division

AMERICAN CHAIN & CABLE

Bridgeport, Conn. • Factories: *York and *Braddock, Pa.

Sales Offices: *Atlanta, Boston, *Chicago, *Denver, Detroit, *Houston, *Los Angeles, New York, Philadelphia, Pittsburgh, *Portland, Ore., *San Francisco

***Indicates Warehouse Stocks**

Bob showed them a new product that ended rust on work and tools–

STANDARD Special Transparent Coolant

A CASE STORY ABOUT THE ADAMS COMPANY, DUBUQUE, IOWA

Before Standard Oil lubrication specialist Bob Wenger told The Adams Company management about Standard's SPECIAL TRANSPARENT COOLANT, there had been considerable trouble with rusting of work and machines in the plant. There had also been trouble with deposits on the ways of the grinding machines. Rust occurring on parts being processed was resulting in damage and even losses. All of this has been changed.

"Since we changed to your SPECIAL TRANSPARENT COOLANT, we have not had any rusting or deposits on our machine tools, and this product has eliminated the rusting problem on parts being processed through our plant," says Harlow Adams, president of the company.

The Adams Company found they received important additional benefits as well. Operators could now see their work clearly. There was less wheel loading. Because the coolant didn't foam, more of it stayed on the wheel resulting in cooler operation. Faster cuts were obtained with finer wheels. Finer wheels gave better finishes. Periods between dressings were extended. Work ran cooler and tolerances were maintained.

Research, development and more than two years of field testing have gone into Standard's SPECIAL TRANSPARENT COOLANT. This is the pay-out to you on the research done by Standard Oil to bring you better metalworking products. Find out more about Standard's SPECIAL TRANSPARENT COOLANT. Call your nearby Standard Oil lubrication specialist in any of the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 S. Michigan Ave., Chicago 80, Ill.**

Bob Wenger (right), Standard Oil lubrication specialist, and John Charles Uthe, grinding room foreman, inspect grinding operation which uses new Standard's SPECIAL TRANSPARENT COOLANT. Bob Wenger is well qualified to go into the shop and make lubrication recommendations. He has been doing this sort of work for nine years. He has an engineering degree from Iowa State College and, in addition, has completed the Standard Oil Sales Engineering School.

Quick facts about

Special Transparent Coolant

- Clear, transparent fluid.
- Able to control corrosion and rust on work and machines.
- All chemical. Does not support bacteria growth.
- Unaffected by humidity.
- Nonfoaming.
- Fire resistant.
- Odorless.

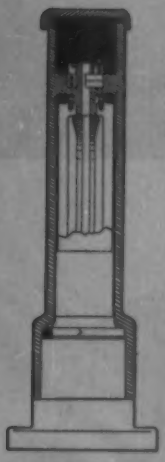
You expect more from **STANDARD** *and get it!*

No rust. Shaft ground with Standard's SPECIAL TRANSPARENT COOLANT shows no rust on inspection by A. T. Murphy, General Superintendent, Harlow Adams, President, and Bob Wenger, Standard Oil lubrication specialist.

Made at .100" feed with a 3" HSS twist drill driven at 45 rpm in solid steel by the Chipmaster radial.

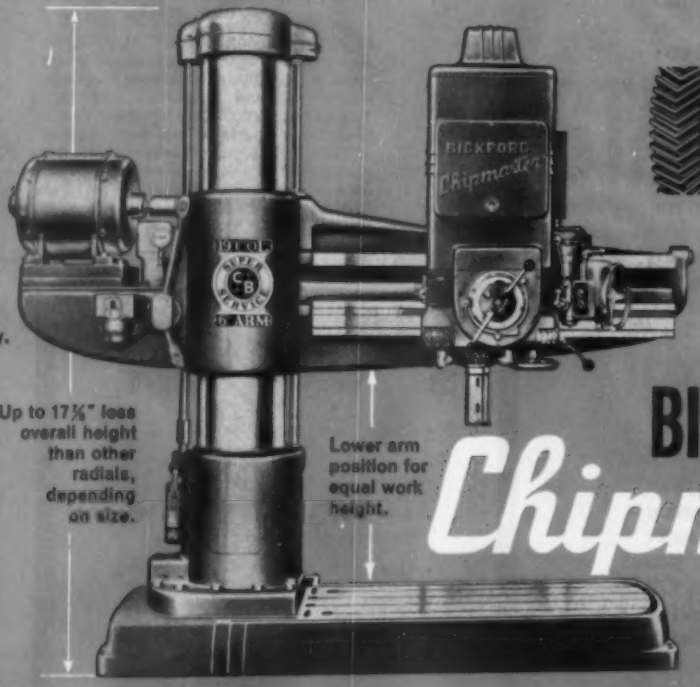
here's the chip

in the all-new radial



Shortest, most rigid radial column built—with preloaded ball bearings top and bottom!

A shorter column means greater rigidity.



Exclusive herringbone drive gear for slow speeds and heavy feeds—the only radial with this feature.

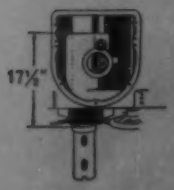
Up to 17¼" less overall height than other radials, depending on size.

Lower arm position for equal work height.

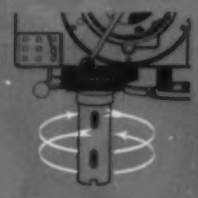
BICKFORD Chipmaster

13"-15"-17"-19" columns.

Preloaded spindle bearings—four preloaded precision ball bearings take severe thrust and radial loads of heavy boring and drilling. Spindle is heat-treated chrome-nickel alloy steel.



Spindle sleeve is carried in honed bore—17¼" of support for the precision-ground, chrome-plated, heat-treated alloy steel sleeve!

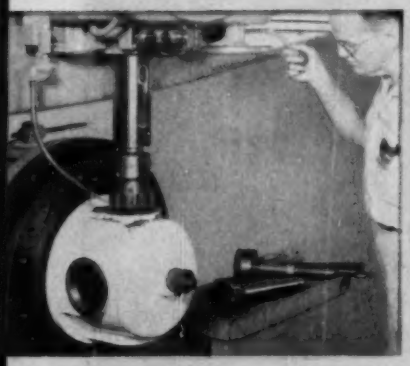


Instant reversal of spindle at any speed—heavy herringbone drive gear is declutched for high-speed operation. Absence of flywheel effect permits instant reversal of spindle at any speed.

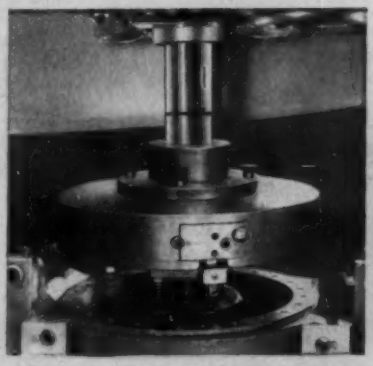
CIRCLE 210 READER SERVICE CARD

that proves the difference . . .

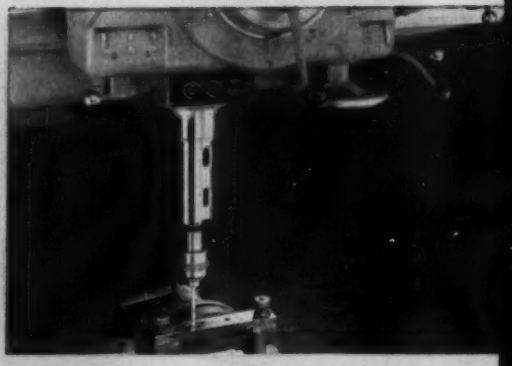
that cuts costs on jobs like these!



TAPPING CLASS 3 FIT THREADS! Hole is bored to size at .083-inch feed in 27 seconds, faced at .020-inch feed in 25 seconds, and tapped to a class three fit in 40 seconds, a total of 1⅓ minutes for all three operations!



BORING "BANJO" HOUSINGS! Here's a job that proves a radial! 19¼-inch boring of cast steel differential housings on production-line basis. Cincinnati Bickford radials also are used for drilling, tapping, and facing operations on this part.



SMALL HOLE DRILLING AND TAPPING! The same Chipmaster that will handle heavier jobs than any other radial is an accurate, sensitive machine to handle 3/16 and ¼-inch drills and taps at high speeds without breakage.

The all-new Cincinnati Bickford Chipmaster radial drilling machine enables you to handle jobs on radials that you are now handling on more costly machines.

Look at the pictures above. Here's a machine that runs the range from the heaviest boring, drilling, spade drilling, trepanning, and facing operations to light-duty high-speed drilling and tapping.

When you have a machine that will make the *Big Chip* shown at the top of this page, you know you have rigidity, thrust capacity, power, accuracy, and versatility never before equaled in a radial drill.

. . . The speed and feed you need for the job you want to do:

drilling—boring—tapping—reaming—spade drilling—trepanning—facing

36 speeds in any of 5 ranges:
8-1000, 10-1250, 12-1500, 14-1750, or 18-2300 rpm.

18 feeds: .004″ to .125″

Tap leads—3 ranges:
8, 11½, 14, 18, 20, and 27, or
8, 10, 12, 14, and 27, or
8, 10, 11½, 14, 20 and 27

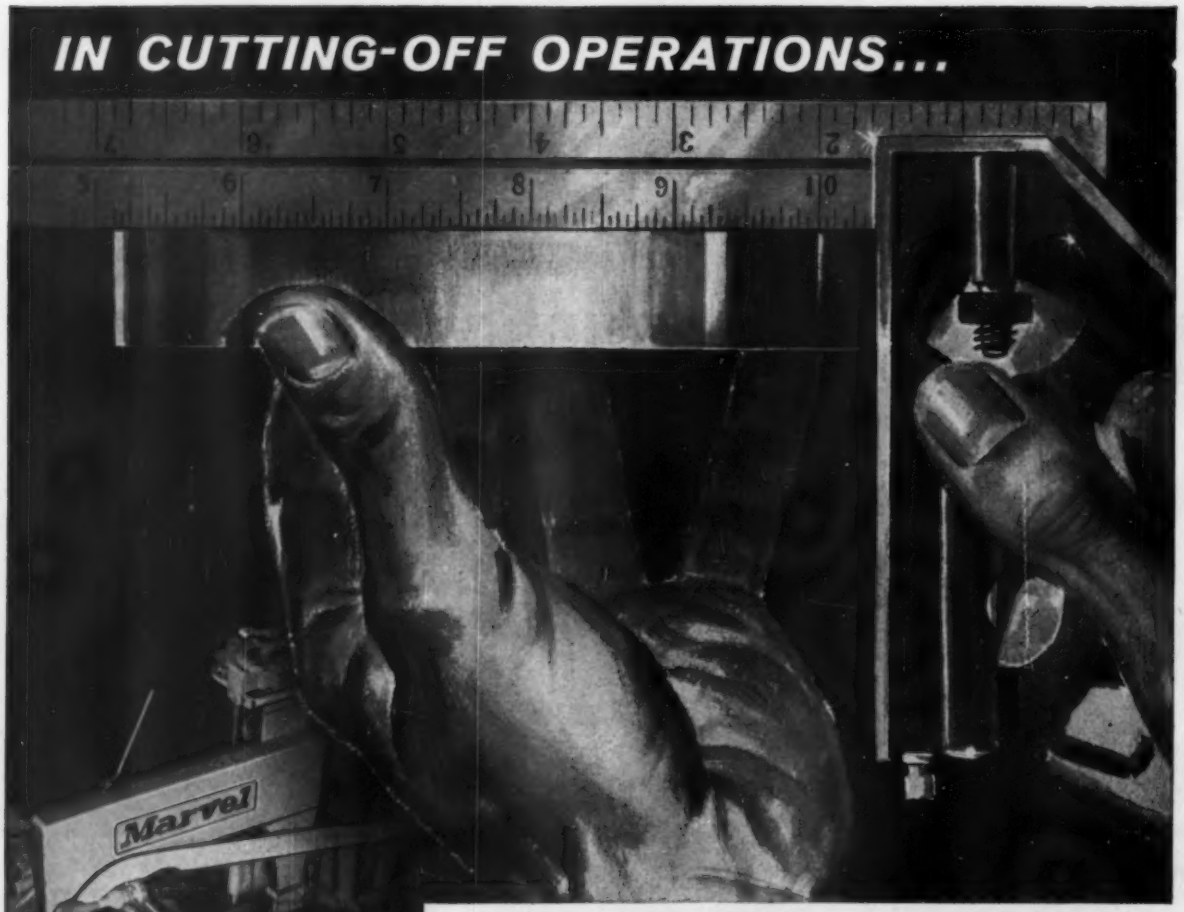
To save time and cut costs, to do more than ever before with a radial, get all the facts about the Bickford Chipmaster. Call your Bickford distributor or WRITE FOR CATALOG TODAY.

CINCINNATI BICKFORD DIVISION
Giddings & Lewis Machine Tool Company
Oakley, Cincinnati 9, Ohio

GIDDINGS & LEWIS

CIRCLE 211 READER SERVICE CARD

IN CUTTING-OFF OPERATIONS...



...SPEED WITHOUT ACCURACY

IS COSTLY!

Efficient cut-off of steel blanks from bars demands a combination of speed *and accuracy*. MARVEL, and MARVEL alone, achieves this combination with machines capable of delivering feeds and speeds which fully utilize the strength and heat resistance of the modern high speed hack saw blade.

MARVEL dual power feed and crank lever method of reciprocation are two exclusive features designed to give increased speed and efficiency. This unique dual power feed employed on the Series No. 6 and No. 9 MARVEL Ball Bearing Hack Saw Machines, simultaneously controls both positive feed depth and feed pressure, automatically adjusting both pressure and depth of feed correctly in proportion to the number of teeth in contact with the work. This automatically forces the blade to cut as deeply as possible and practical on every stroke, without demanding the attention of the operator. As a result, the work is cut-off in the fewest possible number of strokes. Quick return of the saw frame on the non-cutting stroke, accomplished by the crank lever, delivers 33⅓% more cutting strokes per minute without increasing the blade velocity on the cutting stroke.

Accuracy is assured by the construction of the machine itself. Anti-friction ball or roller bearings are used at all load carrying points. The saw frame reciprocates on fully enclosed special design ball bearings which are factory adjusted with a pre-load, assuring permanent frictionless rigidity. Saw frame, saddle, and upright are precision machined and fitted to form a rigid integral unit capable of withstanding any cutting load with no deflection or side movement.

These exclusive features found only in MARVEL Hack Saw Machines, together with the unequalled performance of the unbreakable MARVEL High-Speed-Edge Hack Saw Blade, form a team that guarantees the fastest, most accurate cutting-off.

S-1300

There is a MARVEL field engineer near you capable of intelligently discussing your cut-off work. Send for catalog C-55, and the name and address of your nearest MARVEL field engineer.

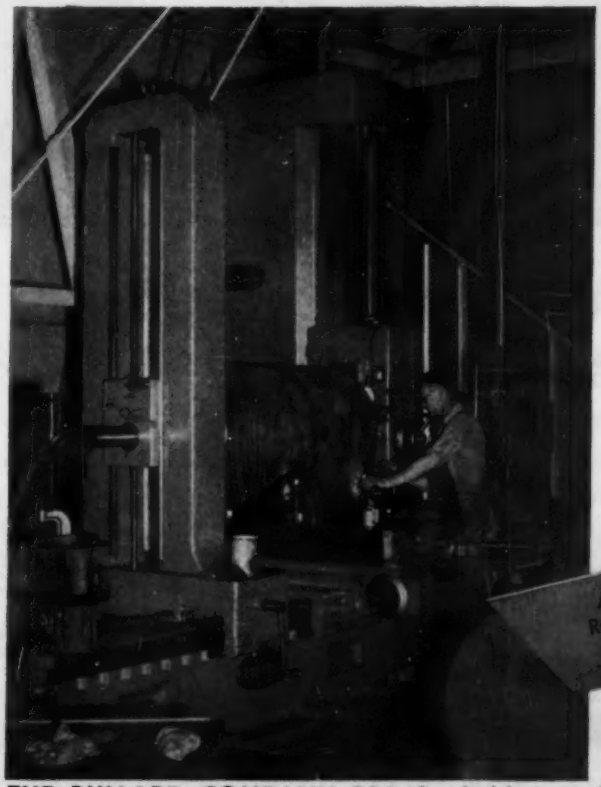
ARMSTRONG-BLUM MFG. CO.
5700 WEST BLOOMINGDALE AVE. • CHICAGO 39, ILL.

Metal Cutting **MARVEL SAWS**
Better Machines–Better Blades

"To meet Today's and Tomorrow's Complex Machining Problems

we bought a . . .
BULLARD"
H.B.M. model 75

This statement by Mr. Reed Clark, General Manager, C. & H. Machine and Engineering Company, Berkeley, California summarizes, after thoroughly investigating and comparing competitive machines, their conclusion.



If you are planning to purchase a horizontal boring machine, we invite you to compare, feature for feature, the Bullard H.B.M., Model 75 with other machines in its field. You will discover that — "To Cut Costs When Cutting Metal — Buy Bullard" — is sound advice.

A call to your Bullard Sales Representative or Distributor will bring you the complete story.

BULLARD

THE BULLARD COMPANY 286 Canfield Ave. Bridgeport 9, Connecticut

As these engine blocks are uniform

. . . So Card taps and gages are uniform, too

Your production's consistent ...because Card taps are uniform

Your first step in consistent production performance is the cutting tool itself. Because Card taps are identical they keep production up to par—and predictable. Shopmen know about the uniformity of Card taps. The gages are like that, too. S. W. CARD DIVISION, Mansfield, Mass. Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco.

The CARD Quality

CARD

DIVISION OF UNION TWIST DRILL COMPANY

— Serving you through the best distributors from Coast to Coast

CIRCLE 214 READER SERVICE CARD

If you use inserted blade cutters as much as printing presses use newsprint...

This brand cuts down your cutter usage, production time and costs!

The more you use cutters the more you need Union

Union cutters — best in design, materials and workmanship — provide consistent top performance and lowest costs per piece you produce. Union builds special profit-boosting advantages into them. Besides this type of cutter, Union also makes solid milling and gear cutters, drills, end mills, reamers, hobs and carbide tools. **Available nationally through Union Distributors** and stocked in Union warehouses in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City and San Francisco.

UTD

UNION

TWIST DRILL COMPANY, Athol, Massachusetts

S. W. CARD DIVISION, Mansfield, Mass.; BUTTERFIELD DIVISION, Derby Line, Vt.

See Your UNION DISTRIBUTOR for cutting tools that will save you time and money

CIRCLE 215 READER SERVICE CARD

Tries many other cutting oils, but sticks with Gulfcut for

GULF MAKES THINGS

"Some people buy, or mix, specialty cutting oils in the hope of working miracles. We've tried the 'miracle-workers'—but we get best results with Gulfcut cutting oils, and have stuck with them for over 15 years."

That's the report from Steven Kowaleski, a partner in Tyler Automatics, Inc. of Thomaston, Connecticut—for many years, successful manufacturers of precision parts for the electronics, automotive and aircraft industries.

The machinists at Tyler Automatics know that Gulf makes things run better, especially in their cutting jobs on stainless steel and Inconel.

"We get longer chips when machining 303 Stainless with Gulfcut," says Mr. Kowaleski. "This means more heat is being carried away from the cutting edge of the tool. We get less heat and friction, and our tool edges stay sharp longer.

"We've been using Gulfcut oils since 1943. If we have machining problems we know we can call on Gulf and

Above, a corner of Tyler Automatics' plant, showing a row of Brown & Sharpe 00G automatic screw machines. At left, a close-up of one of these machines in operation with Gulfcut 45B. Work piece is a one inch, 303 stainless steel pin, of 5/16" round stock. Depth of cut: .250". Feed: .007" per rev. Speed: Machine—1492 rpm. Cycle—20 sec. Tolerance: ±.001". Finish: 100 micro-inch.

Steven Kowaleski, right, of Tyler Automatics, Inc. checks his cutting oil needs with Joseph Reynolds, Gulf Sales Engineer. Tyler Automatics uses Gulfcut 45B and 31C in machining high quality precision parts.

15 years . . . because

RUN BETTER!

get the help we need. Gulfcut oils really do the job."

In the complete Gulfcut line there's a performance proved cutting oil to meet each specific requirement in your shop. A Gulf Sales Engineer will help you in your selection—call him at your nearest Gulf office.

New—Gulfcut Heavy Duty Soluble Oil, a superior emulsifying cutting oil that is setting new performance records in scores of machine shops. Send the coupon for literature on this outstanding development.

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Dept. DM, Gulf Bldg., Pittsburgh 30, Pa.

Send me illustrated bulletin on
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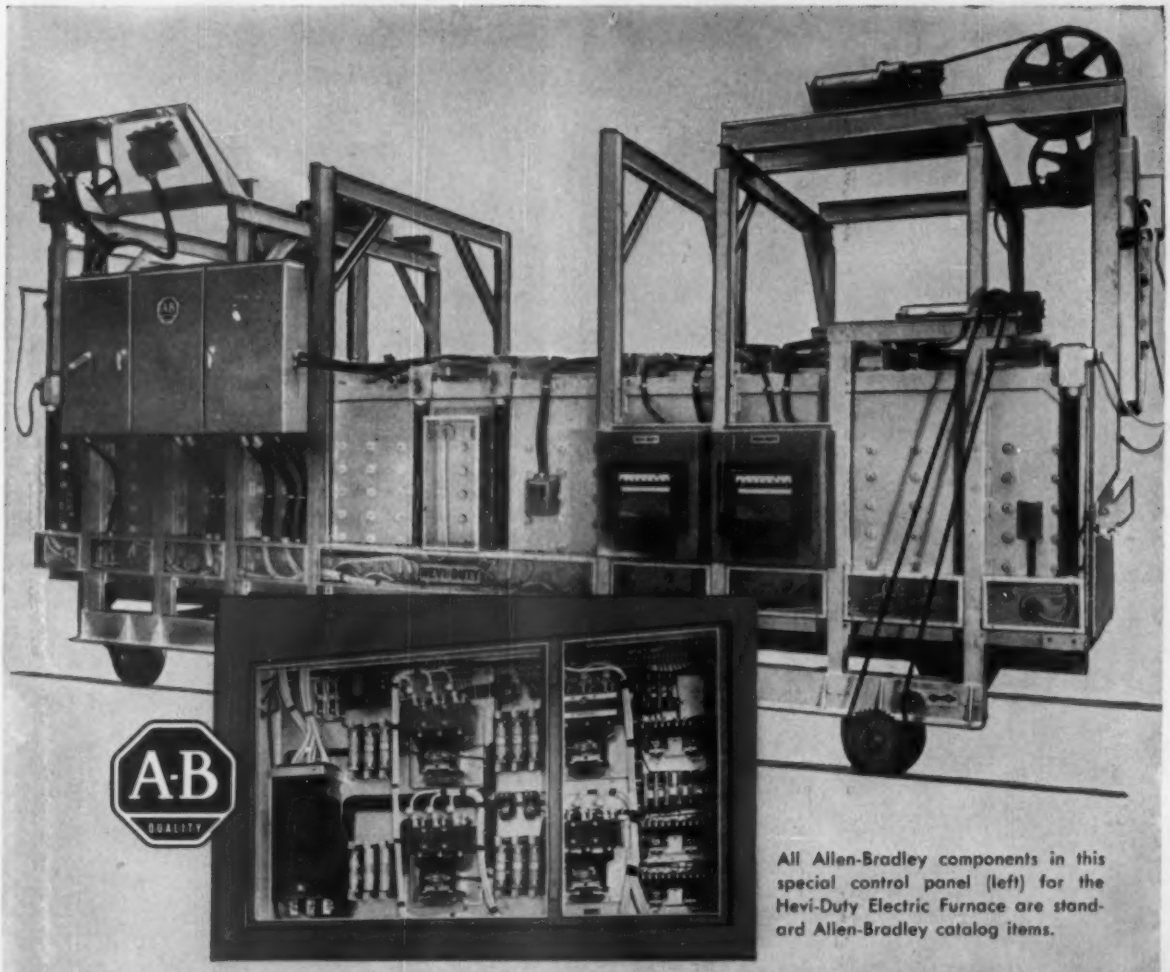


All Allen-Bradley components in this special control panel (left) for the Hevi-Duty Electric Furnace are standard Allen-Bradley catalog items.

For many years, Hevi-Duty Electric Company has used ALLEN-BRADLEY Quality Control

Reliability of the control—a "key factor" in the operating efficiency of automatic machines—is assured when you specify Allen-Bradley *quality* control for your production equipment.

Allen-Bradley motor controls are *trouble free* because they have the *simplest* operating mechanism yet devised . . . there is only ONE moving part. This solenoid construction—around which *all* Allen-Bradley starters, contactors, and relays are built—is good for millions of dependable operations. There are no bearings to corrode and stick . . . no flexible jumpers to wear and break. In addition, the double break, silver alloy contacts never need servicing.

Standardize on Allen-Bradley motor control—the control of proven reliability. Your customers will enthusiastically endorse such a decision.

Allen-Bradley Co., 1310 S. Second St., Milwaukee 4, Wis. In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

Another automatic production machine "goes Allen-Bradley"

PRODUCTION POINTERS from GISHOLT

More cost-cutting IDEAS— to help you

CHAPMAN VALVE SAVES 155 MINUTES ON CHECK VALVES

Improves quality...cuts costs and maintenance of form tools

Here's a way to save time and money by applying new thinking to old jobs. With this setup on a new Gisholt MASTERLINE 2L Saddle Type Turret Lathe, The Chapman Valve Manufacturing Co., Indian Orchard, Mass., saves an average of 155 minutes on each of 4 sizes of cast carbon steel tilting disc check valve bodies.

Special equipment includes a reduced feed selective gear box, a "tenth" dial indicator and longitudinal feed dial for the cross-feeding hex turret plus a fixed, 25°-angle cam in the cross-feeding turret taper attachment.

Here's the sequence on a typical 6" valve body:

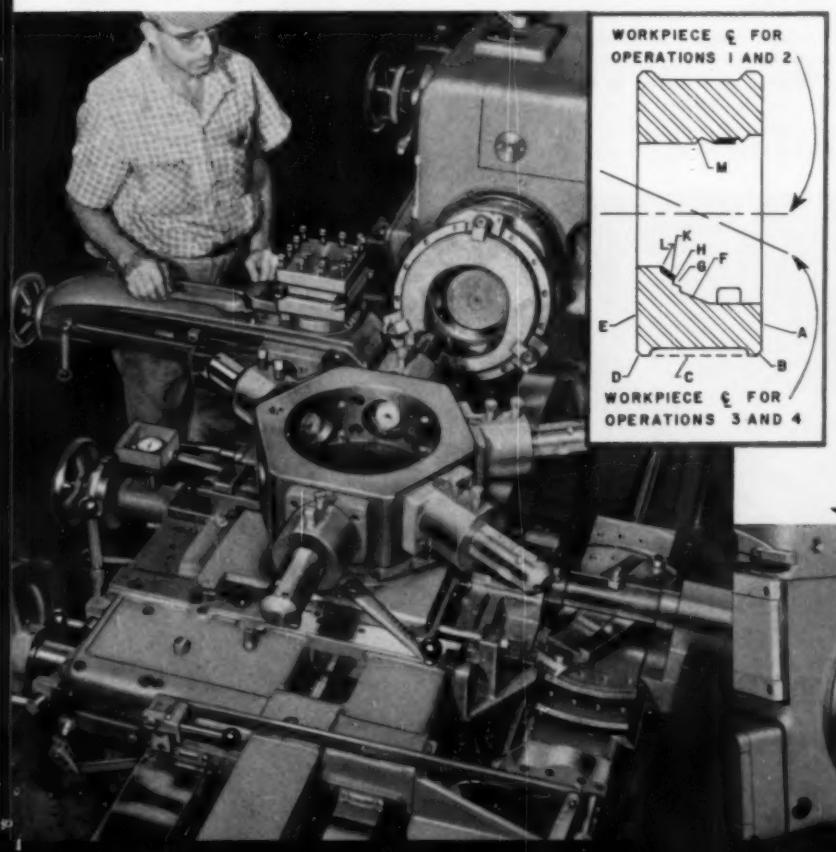
Operation 1—Chuck at C, locate at E in 18", three-jaw air chuck. Face A, chamfer B and turn C to chuck jaws. Time, 43.0 min. f.t.f.

Operation 2—Using same chuck, locate at A, hold at C. Face E, chamfer D and finish-turn C. Time, 31.0 min. f.t.f.

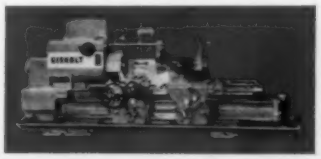
(In these two roughing operations, ½" stock is removed on diameter and ⅜" per side on facing. Hex and square turrets are used simultaneously wherever possible to save time.)

Operation 3—The part is placed in a counterbalanced, angle fixture. It is oriented to a scribed mark on the fixture, located against surfaces C-E and hand-clamped at A. The longitudinal feed dial and "tenth" indicator are used to speed positioning as hex turret tools rough- and finish-bore surfaces F-G-K-L-M. The 25° fixed cam in the taper attachment assures accuracy and rigidity on surfaces K-L. Time, 24.2 minutes, f.t.f.

Operation 4—The stainless steel valve seats are inserted in a separate operation. Then back to the 2L, where the same fixture and holding method as in Oper. 3 is used for finishing the seats. Only hex turret tools are used as surfaces F-G-M are remachined to remove welding flash. The stainless steel valve seat is faced at H and taperbored at K, using the dial indicator to hold the close tolerance in the bore. Time, 34.8 min. f.t.f.

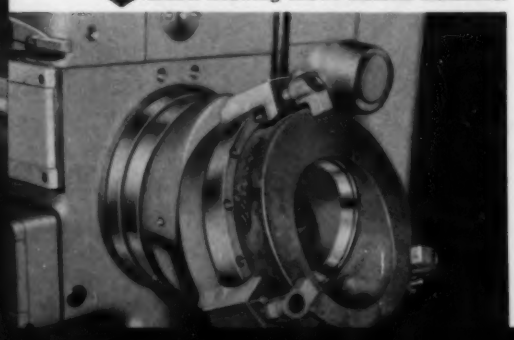


One new machine saves 155 minutes machining time per part, replaces two older units. New tooling method eliminates cost and maintenance of form tools. Reduced feed gear box for seat boring provides 32 micro-inch finish. Additional savings are derived through reduction in lapping time.



Tooling for Operation 4. Note dial indicator at left and 25°-fixed-angle cam in taper attachment at right. Low-cost standard carbide tools on cross-feeding hex turret replace expensive form tools previously used.

Close-up of workpiece after Operation 4 and fixture. Drawing shows surfaces machined.



STANDARD MACHINE INCREASES PRODUCTION 250%

Avoids cost of special machine with smart chucking, compact tooling

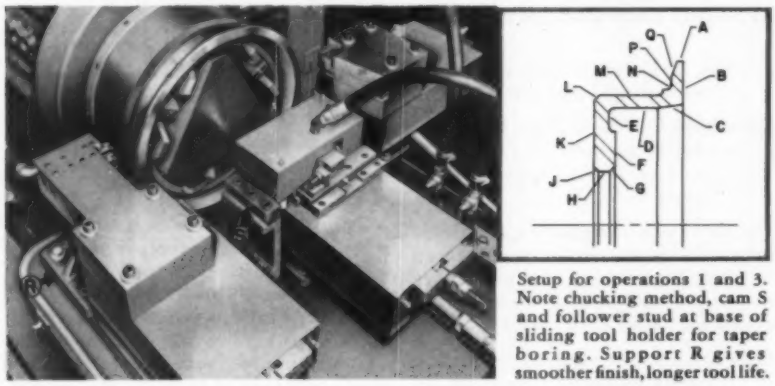
Here several tooling tricks are revealed in the way 20½"-diameter, 2"-wide steel brake ring forgings are machined. Two Gisholt Simplimatic Automatic Lathes replace older machines, increasing production from four to ten parts per hour.

For operations 1 and 3 on the first machine, distortion of forgings is avoided by locating against K in a drawback fixture, centralizing on three pins in bore H. Three clamps, with two swivel fingers on each, hold at six points on web F. Front slide tools rough-turn M-A with extra support from bracket R. Center slide tools rough-bore D, undercut E, and rear slide tools straddle-face P-B. Total time, 3.6 minutes f.t.f.

A similar fixture is used for operations 2 and 4 on the second machine. Work locates against B, centralizes on a chucking ring at D, and clamps at P. In operation 2, front slide tools rough-bore H, and rear slide tools straddle-face K and F in 4.6 min. f.t.f.

In operation 3, a sliding tool holder in the center slide tool block follows tapered cam on bracket S, to generate 15° angle C, finish-bore D, finish-form E, chamfer G. Front slide tools finish-turn M-N-A, chamfer L. Rear slide tools finish-face P-B, chamfer Q in 3.6 minutes f.t.f.

During operation 4, front slide tools finish-bore H, chamfer J; rear slide tools finish K-F in 4.6 minutes f.t.f.



Setup for operations 1 and 3. Note chucking method, cam S and follower stud at base of sliding tool holder for taper boring. Support R gives smoother finish, longer tool life.

Centralizing pins or chucking ring and six-point clamping eliminate chucking pressure distortion and improve accuracy, concentricity and parallelism. Sliding tool block locks in place for straight boring or follows cam S to generate accurate taper.

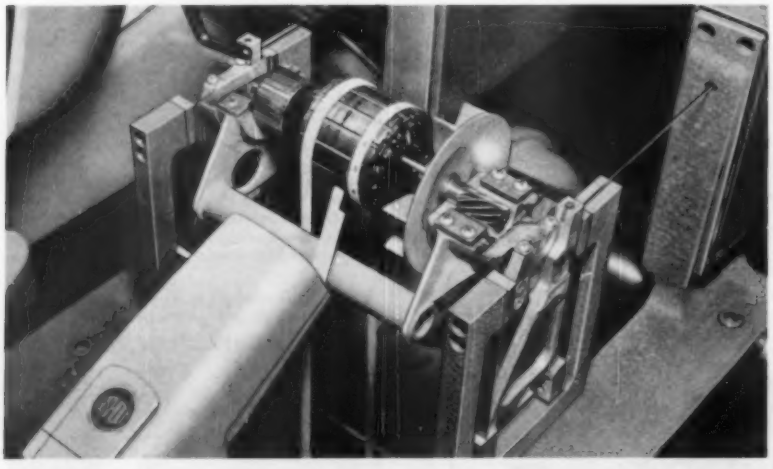
HOW BALANCING IMPROVES QUALITY AT AMERICAN ELECTRIC MOTORS, INC.

Setup eliminates guesswork on high-speed parts

You may find ideas in this 1S Balancer setup to help you improve your products. It's doing just that for American Electric Motors, Inc., a subsidiary of American-Lincoln Corp., Toledo, Ohio.

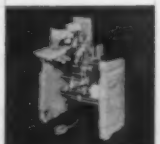
The workpiece shown is an armature, fan and drive gear assembly for a hand power saw and operates at speeds up to 10,000 r.p.m. Accurate balancing is a "must" for vibration-free operation and long service life. A cradle fixture is used to hold the work between the balancer supports. Although this increases the parasitic weight, the balancer's electrical system permits virtually infinite amplification of unbalance vibrations and accuracy is not impaired.

As the part is rotated, the operator notes the angle and amount of unbalance in each correction plane. The direct reading amount meter is calibrated in terms of the specific correction method used for each plane. This eliminates computation by the operator. The assembly is removed and the left end corrected by inserting slugs between the laminations. These are pre-cut and sorted by weight in handy trays for quick selection. The right end is corrected by a punch that removes the indicated amount of metal from the fan blade edge. Production is 25 parts per hour at 80% efficiency. This includes measurement, location, correction and inspection.



Cradle fixture permits this high-speed assembly to be supported on its own bearings even though the right-hand bearing journal is "hidden." Pre-cut metal correction strips, sorted by weight, save added time, minimize chance of operator error.

Gisholt balancing saves time, improves product quality because direct reading amount meter and strobe angle indicator permit finding exact angle and exact amount of unbalance the first time... eliminate all operator "guessing."



ASK YOUR GISHOLT REPRESENTATIVE ABOUT FACTORY-REBUILT

SUPERFINISH LENGTHENS LIFE OF AMERICAN RADIAL DRILL COLUMNS

Low-cost method to reduce abrasion—increases life of column and sleeve

MASTERLINE GISHOLT SINCE 1887

Compare this low-cost, quality-boosting technique with your present operation. Take a good look at the column on this radial drill, manufactured by The American Tool Works Company, Cincinnati, Ohio. It's Superfinished to expose the tough base metal for extra wear life—and smoother operation.

A Gisholt No. 4 Superfinishing Attachment is used, mounted on the carriage of a 40″ American Pacemaker Lathe. Carriage mounting provides longitudinal feed for the entire length of the workpiece. The part shown is 75″ long and 15″ in diameter. In only four hours floor-to-floor time, the ground surface is reduced from 32 to 4 micro-inches R.M.S.

Columns for the entire line of American Hole Wizard Radials are now Superfinished, using this simple, low-cost setup. Column lengths range from 46″ to over 100″ and diameters range from 9″ to 19″. Multiple stone holders permit Superfinishing over the keyways without difficulty. The "mirror" finish on the columns is achieved with a *controlled* diameter reduction of less than .001″.

Superfinishing minimizes lubrication problems and surface wear. Attachment costs considerably less than finish-grinding equipment—yet does the same job. And your lathe can be used for other work.

Low-cost Gisholt No. 4 Superfinishing Attachment mounts on lathe carriage... handles a complete range of column sizes.

All American Hole Wizard Radial Drills now feature Superfinished columns. This assures easier operation and longer life—a real sales point in today's competitive market.

GEAR FORGINGS MACHINED IN JUST ONE MINUTE

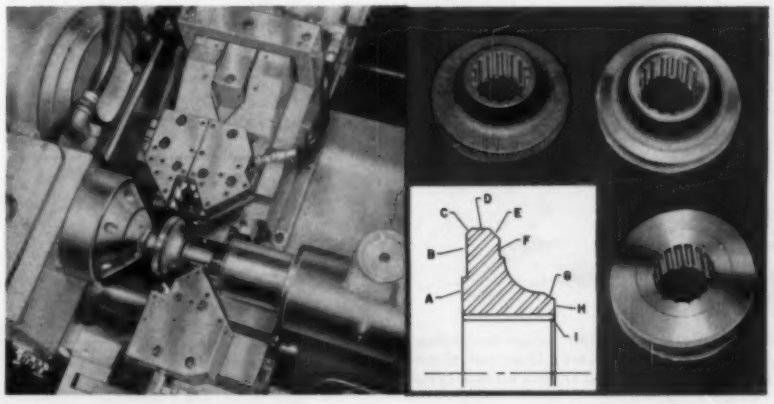
Smart setup includes arbor, loading cradle and straddle tooling

Here's how this tractor manufacturer makes simplicity pay big dividends—not only in time saved, but in improved quality. The parts are steel gear forgings—handled on a Gisholt No. 12 Automatic Production Lathe.

The part shown is $5\frac{7}{16}$″ in diameter, $1\frac{25}{32}$″ wide, with a spline broached in the I.D. The part is pressed in place on a supporting arbor and is located longitudinally in a fixture on the arbor press. This is done while another part is being machined.

The square end of the supporting arbor is centered and driven in a spindle-mounted fixture. To speed safe loading, a simple V-block loading cradle supports the other end while it is being picked up by the tailstock center. Front carriage tools turn D, chamfer G-I. At the same time, tools on the rear independent slide straddle-face B-F, A-H and chamfer C-E. A simple hydraulic arrangement moves the two rear slide tool blocks together for machining and apart for tool relief. Total f.t.f. time, just 1.0 minute.

Supporting arbor, loading cradle, straddle-facing tool blocks with hydraulic tool relief permit fast, accurate machining of front and back surfaces in one automatic cycle.



Overhead view of tooling and workpiece. Note square end of supporting arbor in work driver. Straddle-facing tools on rear blocks move together for machining, apart for tool relief.

Workpiece showing rough part and surfaces machined, front and back.

GISHOLT

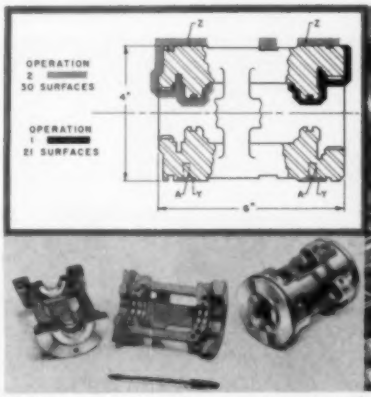
MASTERLINE GISHOLT SINCE 1887

AIRESEARCH SLASHES TIME 35% ON CARRIER ASSEMBLIES

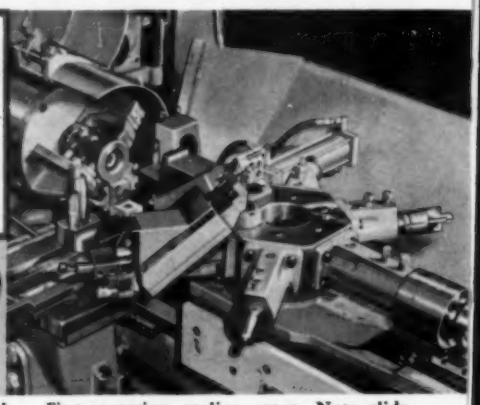
Hydraulic drive permits one operator to run two machines

Here's proof that a small added investment in automatic controls pays big dividends. Study this setup used at AiResearch's Industrial Division plant in Los Angeles, Calif. It cuts machining time 35%, doubles operator productivity and improves accuracy on cast semisteel bearing carrier assemblies.

Two Gisholt MASTERLINE No. 3 Ram Type Turret Lathes are used. Hydraulic drive units provide automatic cycle operation. Spindle speed and feed changes, turret indexing and all tool operations are automatic, including work done from the cross slide. Forming, grooving and backfacing for both the first and second operations are handled by turret-mounted slide tools. On forward feed



Workpiece consists of two sections, bolted for machining. Left—two halves, opened to show internal surfaces machined. Right—assembled to show external work.



First-operation tooling setup. Note slide tools operated by dead-stop cam at center of cross slide. Collapsing tap at right is re-cocked by cam block at rear of turret ram.

the movable slides engage a dead-stop cam on the cross slide and are actuated by continued forward movement of the turret ram. Reverse traverse provides automatic turret relief.

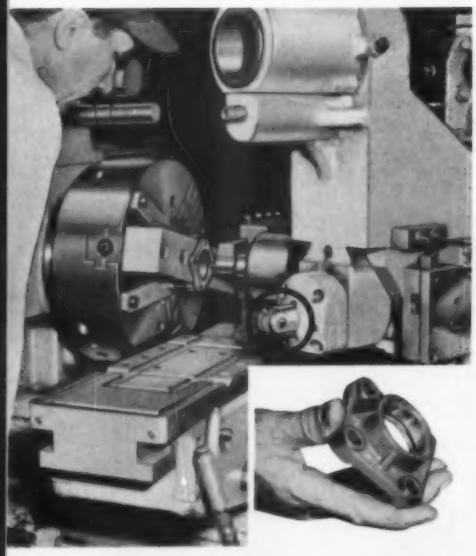
Parts consist of two mating sections bolted together. For the first operation, work locates on pins A against milled faces Y, on a fixed base. A swivel jaw holds at two points Z. Hex turret and cross-slide tools machine the 21 surfaces shown in black, including threading of the large bore, in only 2.5 minutes f.t.f.

Work then goes on the second machine. It is screwed on a threaded, drawback plug, locating against the machined face. The 30 surfaces shown in gray are finished from the hex turret and cross slide. Again, this includes threading of the large bore. Time, 4.35 minutes f.t.f.

Hand-operated machine with hydraulic drive becomes cost-cutting automatic. Operator simply loads, unloads and starts new cycle. Handles two units, inspects and stacks work.

HOW UNITED STEEL CORPORATION, LTD., CUTS COSTS ON PILLOW BLOCKS

Double-tooled Fastermatic and spherical boring tool speed production

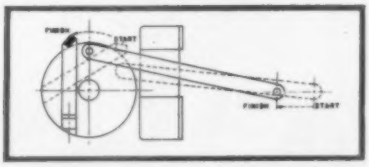


Pillow block in two-jaw fixture and spherical boring tool (encircled). Inset, part showing surfaces machined in two-minute cycle.

Here's a real time-saving setup for generating spherical bores in shell-molded pillow blocks to a .0005″ accuracy. United Steel Corporation, Ltd., Toronto, Canada, is using it on a Gisholt 2F Fastermatic Automatic Turret Lathe.

The work is held in a two-jaw fixture—one jaw stationary for location, the other movable for chucking. It is bored through from hex 1. A slide tool on hex 2 forms a grease groove in the bore.

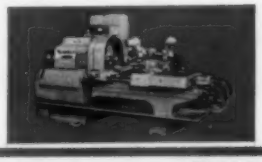
The top, movable portion of the slide tool on hex 3 carries the spherical boring tool and holder (encircled). The boring tool is linked to the slide base mounted on the turret face. On forward feed, the slide top engages a stop. The boring tool remains in a fixed position in relation to the work, while the slide base feeds forward, rotating the tool, generating the spherical bore (see drawing). A duplicate set of tools on stations 4, 5 and 6 finishes two parts with each turret index. Time, on a 2 7/16″ pillow block, 2.0 min. f.t.f.



Link attached to slide base feeds toward spindle, forces spherical boring tool holder to rotate, generating spherical bore.

Six boring heads handle ten parts, ranging from ½″ to 2 15/16″. The tool in each head is set to gauge for various diameters within its range.

Single-point spherical boring improves accuracy and finish. Double-tooled turret permits longer runs between tool changes, saves time of indexing past idle stations.



No. 11-1258
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The Gisholt Round Table represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

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GISHOLT MACHINE COMPANY Madison 10, Wisconsin

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Machines • Packaging Machines • Masterplas Molded Plastic Products

MICROMETER THIMBLE is graduated to .0001" and provides dimensions between 1" steps on measuring bar. Measuring bar can be adjusted to enable the user to take readings up or down relative to a center line or other reference line on the work.

accurate to .00005" throughout the 18" range

That's right! Just 10 seconds to set this NEW 18" PLA-CHEK GAGE . . . and you are ready to start your inspections. In hundreds of installations on innumerable jobs PLA-CHEK GAGES are daily proving their time-saving and money-saving advantages. Extremely easy to operate—no auxiliary gage blocks are necessary—this PLA-CHEK 18" model guarantees accuracy to fifty millionths through its entire range. The measuring bar is made of deep-frozen, strain-free alloy steel. Because it is of one-piece construction the steps cannot change or separate with age. Since it is not necessary to touch the measuring bar, body heat does not affect it. Return the coupon or write TODAY for literature and complete details.

Cadillac PLA-CHEK GAGES are available in a complete range of sizes: 6", 12", 18", 24", 36", and 48" models. Precision-made risers, increasing the range of each model, are also available.

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◄ CIRCLE 222 READER SERVICE CARD

CIRCLE 223 READER SERVICE CARD

Profit-saving Performance on every job!

THE NEW BROWN & SHARPE 618 MICROMASTER SURFACE GRINDING MACHINE

THE NEW 618 is designed by Brown & Sharpe specialists to deliver new savings and profits on every type of surface grinding job. It provides *all* the capacity, *all* the speed and efficiency you need to meet today's toughest demands in the toolroom and in continuous production runs. You get *300% faster* table speed range . . . *60% larger* work space area . . . *super-precision* performance.

BEFORE YOU BUY any surface grinder, be sure to see a demonstration of the new 618 at one of the locations listed below. See for yourself how much *more* you get for your investment — how much *more* it will pay you in cost-reduction dividends. For complete information, call or write any Brown & Sharpe machine tool dealer, district office, or: Brown & Sharpe Mfg. Co., Providence 1, R. I.

See all these MICROMASTER advantages — and many more

- **FASTER, COOLER GRINDING** — any desired table speed from 5 to 100 ft. per min.
- **TAKES BIGGER WORK PIECES** — up to 14" high under 8" wheel — up to 18" with extra equipment
- **"MICROMASTER" PRECISION** — graduations read to 0.0001" on vertical feed and 0.0002" on cross feed handwheels
- **ULTRA-SMOOTH "ORIFLEX DRIVE"** to wheel spindle, with choice of super-precision, sealed antifriction bearing or plain bearing unit. Direct motor drive optional with antifriction bearing spindle only
- **OPTIONAL ELEVATING HANDWHEEL LOCATION** — on front of bed or on upright
- **ACCURATE SLOT GRINDING** — table mounted directly on precision V and flat guide ways in table base casting — no carriage — no table "twist" — no clamps required. Cog belt drive to table for smooth, positive hand travel
- **CONTINUOUS HYDRAULIC CROSS FEEDS** of 10" per min. for wheel truing and 144" per min. for rapid transverse positioning of wheel spindle upright
- **SINGLE CONTROL** permits restarting at pre-selected table speeds
- **RUGGED SPINDLE SLIDE, UPRIGHT, AND BED** of cast iron, to assure highest accuracy and surface quality
- **AUTOMATIC LUBRICATION** — assures long wear, simplified maintenance
- **COMPLIES WITH BASIC JIC ELECTRICAL STANDARDS**

See a DEMONSTRATION of the NEW BROWN & SHARPE 618 MICROMASTER at any of these B&S MACHINE TOOL DEALERS . . .

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6" x 18"

*Also available with
— Hydraulic Table Speeds and Hand Cross Feeds
618PH
— Hand Feeds Only
618H

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J. M. Grisley Machine Tools

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The Portland Machinery Co.

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PROGRESS IN PRECISION FOR OVER 125 YEARS

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ROCKWELL-BUILT

DELTA 20" DRILL PRESSES

Multiple spindle set-ups
do the work of machine tools costing twice as much

Making heavy-duty staplers and industrial stitchers calls for precision drilling operations and production line ruggedness. At Bostitch Inc., East Greenwich, R. I., five multiple spindle Delta 20" drill presses (6 spindles each) work alongside machine tools costing twice as much. And, according to John Larke, Chief Methods Engineer, "Delta fills the bill at surprisingly low cost."

COST CUTTING EXTRAS offered by these versatile Delta tools include five speeds, easy "up front" speed changes and independently powered spindles for greater protection against downtime due to motor trouble.

"CATALOG ENGINEERING—buying Delta tools by components instead of complete units—gave us production tooling to meet our exact needs," says Mr. Larke. Using six 20" Delta spindle heads mounted on a standard 17" drill press production table minimizes work transfer operations and saves valuable floor space.

See Delta drill presses and a complete line of industrial metalworking tools and accessories at your nearest Delta Dealer . . . he's listed under "TOOLS" in the Yellow Pages. Choose from the WORLD'S MOST COMPLETE LINE of drill presses: 20", 17", 15", 14" and 14" Super-Hi Speed in floor, bench and overhead models.

Learn how YOU can cut costs with Delta Industrial Tooling—write for FREE Drill Press Catalog to: Rockwell Mfg. Co., Delta Power Tool Div., 618M N. Lexington Ave., Pittsburgh 8, Pa.

DELTA POWER TOOLS

another fine product by

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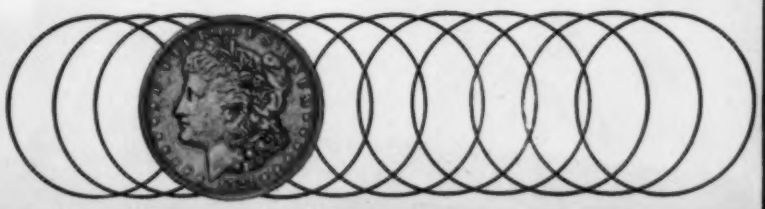
CTRONIC ONTROL YSTEMS

LEADERS IN NUMERICAL CONTROL

S-C STROMBERG-CARLSON



lowest cost contouring control

DIGIMATIC 191

CONTOURING CONTROL SYSTEM

Lowest cost machine tool contouring system now on the market, both in purchase price and operating expense. Simple to program and operate. Designed for everyday use in the average machine shop to shorten lead times, reduce costs, improve quality and increase output.

Fits medium duty tools... small boring mills, knee mills, profilers, lathes... with feed rates up to 25" per minute. Cuts true circles, curves and straight lines with ±0.001-inch control accuracy. Eliminates spoilage, provides exact reproductibility, and drastically reduces machining time.

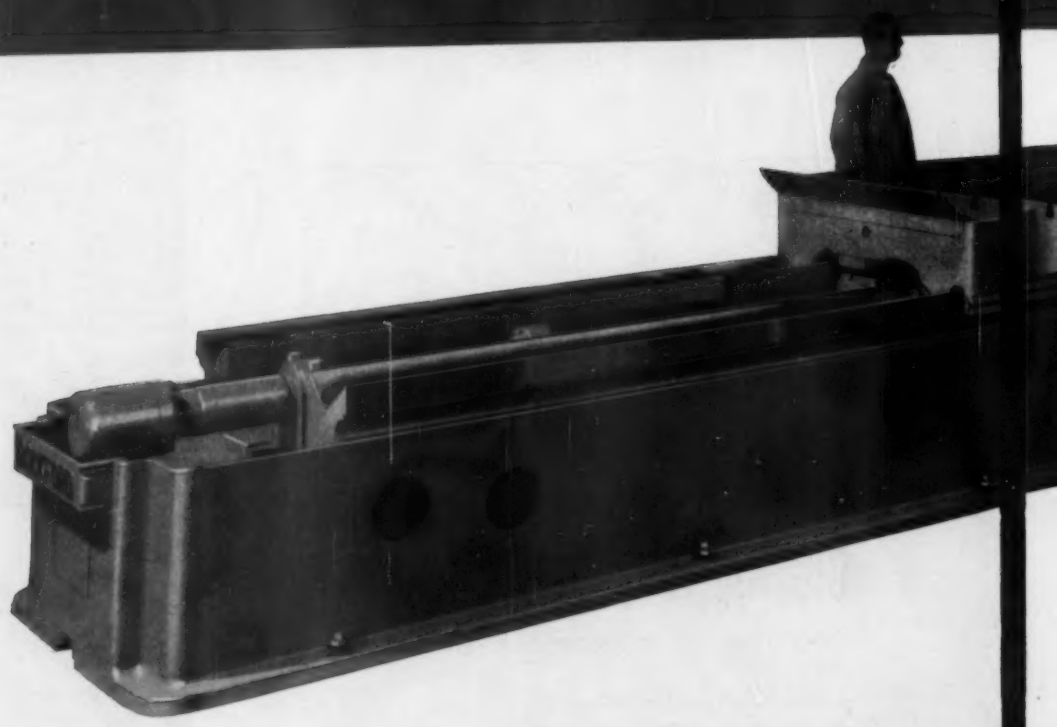
Write for 12-page "Digimatic 191 Systems" Catalog.

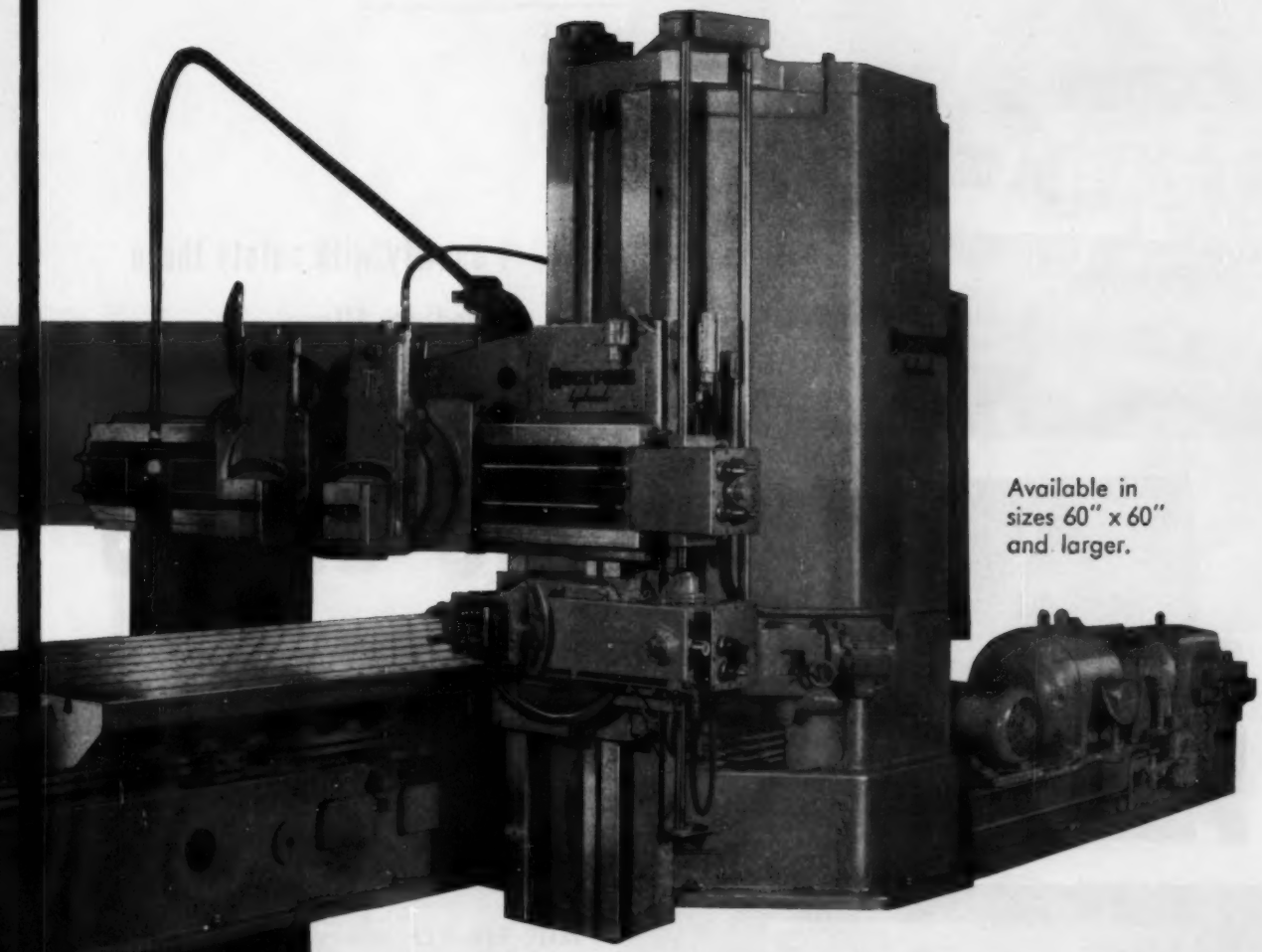
ELECTRONIC CONTROL SYSTEMS
Division of
STROMBERG-CARLSON
DIVISION OF GENERAL DYNAMICS CORPORATION
2231 S Barrington Avenue • Los Angeles 64, California

CIRCLE 227 READER SERVICE CARD

2-speed traverse motors eliminate manual positioning in set-up on

new Rockford Hydraulic Planer





Available in sizes 60" x 60" and larger.

complete pendant control speeds operation and set-up

All feed and traverse movements are selected and operated from the push button station of this new Rockford hydraulic planer. Two-speed traverse motors — high speed for approximate positioning, and slow speed for extremely close power positioning of rail and side heads — eliminate the need for manual positioning in setting-up for a job.

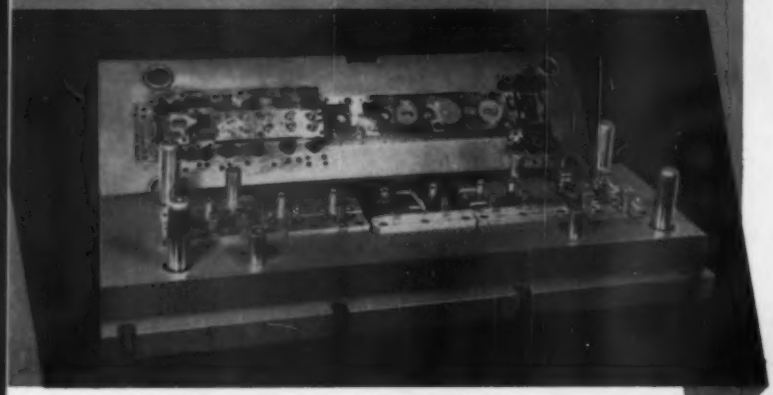
Extra-rugged construction affords use of most modern cutting tools and cutting techniques. The machine is equipped with the new high speed h3 triple circuit.

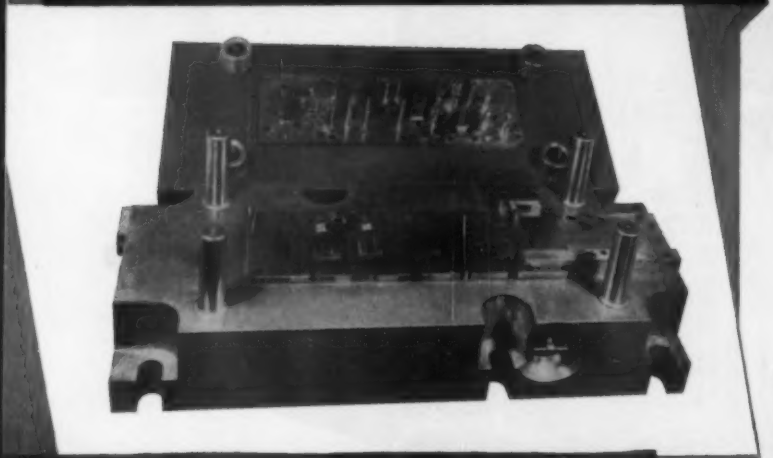
Get full details on the wide production flexibility of this new hydraulic planer from any Rockford Machine Tool Co. representative, or write directly to us.

h HYDRAULIC

ROCKFORD MACHINE TOOL CO.
2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

when all depends on *performance*





specify with safety these

Vanadium-Alloys

Die Steels

FOR COLD WORK

OHIO DIE A high carbon, high chromium type of steel which hardens in air to high hardness with almost no movement. Possesses wear resistance about eight times that of 1% carbon tool steel. Your best choice for long runs between grinds. Available in regular or FM (Free Machining) type.

AIR HARD Air hardening die steel having good machinability and exceptionally high strength and toughness. Movement in hardening about one-third to one-fifth that of oil hardening steels. Used for all types of cold work dies. Safe to harden, safe to grind. Available in regular or FM (Free Machining) types; also in precision ground flats and squares.

COLONIAL No. 6 Manganese oil hardening die steel specially annealed by us to provide easy machining. The general purpose die steel for all tool room requirements. Hardens with a minimum of movement because of the very low quenching temperature required. Available in all sizes and shapes including drill rod and precision ground flats and squares.

•

For machinability, hardenability, wearability and dimensional stability, Vanadium-Alloys Die Steels for Cold Work are unsurpassed in the field. These steels take the gamble out of die steel specifications —let you concentrate safely on production! Our assistance in matching the right grade to the job is yours to command, *and you can depend upon it.* Write for technical Data Sheets.

Vanadium-Alloys Steel Company

LATROBE, PENNSYLVANIA

DIVISIONS: Anchor Drawn Steel Co. • Colonial Steel Co. • Metal Forming Corporation • Pittsburgh Tool Steel Wire Co.

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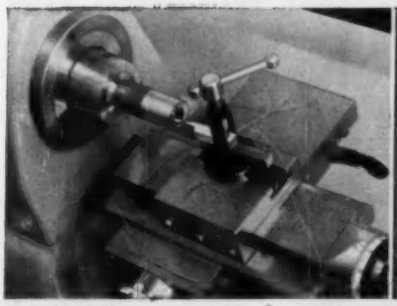
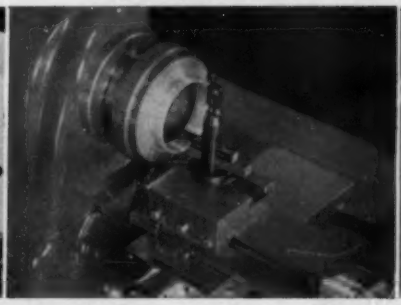
ELMIRA, N.Y.

HIGH SPEED PRECISION LATHE

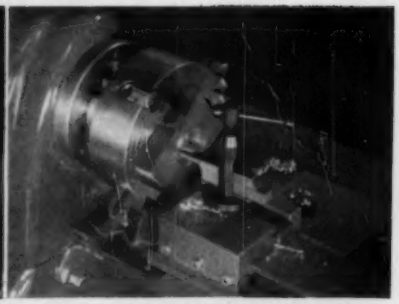
Correct Size - High Speed - Precision Results



Collet Work — The right machine for collet work of 1-1/16" or less diameter.



Step Chuck Work — For rapid and accurate holding of tubing, castings, moldings, stampings and machined parts. Capacity to 6".

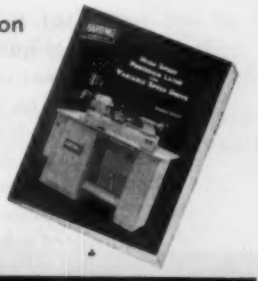


Jaw Chuck Work—Integral mount, universal or independent, for extra accuracy. Capacity to 5".

SPECIFICATIONS:
1⅜" Collet Capacity
9" Swing
17" Center Distance
Infinitely Variable Speed
230—3500 r.p.m.

The above three important requirements for proper lathe work in tool rooms, production departments, or laboratories are completely fulfilled by the new Hardinge DV59 High Speed Precision Lathe.

Correct size of the machine in relation to work saves loss from under-capacity production on larger lathes. High spindle speeds, up to 3500 r.p.m., permit full capacity cutting and excellent finish. Sustained accuracy and ease of operation assure precision results



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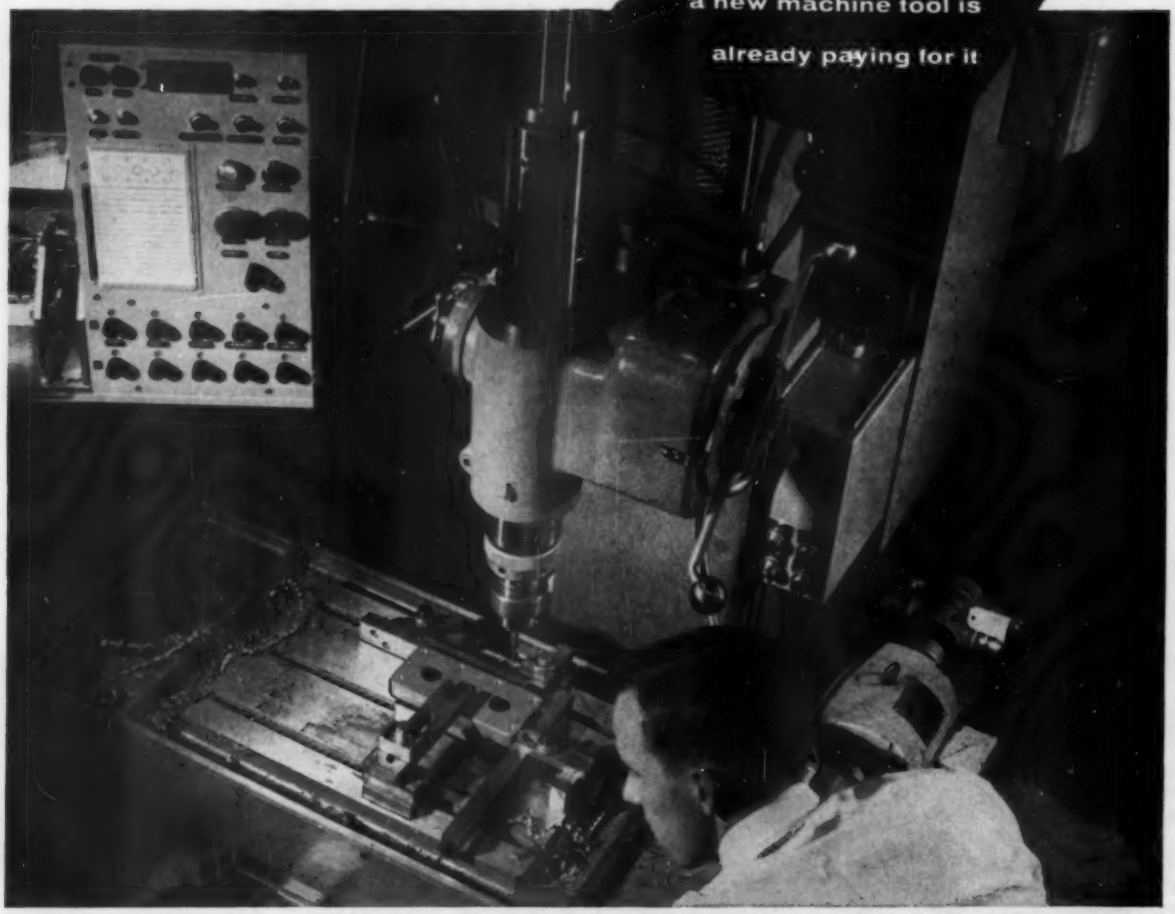
JONES & LAMSON "AUTOMATION"

the man who needs a new machine tool is already paying for it



Numerical control positioning eliminates jigs – saves time

The J&L Numerically Controlled Positioning Table quickly and accurately positions work pieces to an accuracy of ±.001″ — without jigs. And it can do it economically with any lot size down to a single piece.

For instance: in one installation, where precision parts previously had been machined on a conventional spacing table, J&L's new equipment achieved cycle time savings of six minutes per piece and set-up savings of over 116 minutes per set-up, or a total savings of 6.95 hours on a lot of 50 pieces.

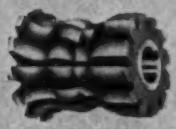
In another plant, the cost of building $4,000 worth of jigs was eliminated during the first six weeks of operation. And in still another operation, the positioning table not only reduced set-up and cycle time, but also eliminated the storing, handling and maintenance of $29,000 worth of jigs.

You can get in on this kind of savings too. Write to Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Fay Automatic Lathes • Milling & Centering Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

GROUND MULTIPLE THREAD MILLING CUTTERS

FORM RELIEVED MILLING CUTTERS



SINGLE POINT TOOLS

FORM TOOLS

BROACHES

FACE MILLS

CONTINENTAL DRIVE TOOLS

Newest Materials and Methods-

Plus the Toughest "Proving Ground" in Industry

What makes one tool better than another? Most engineers boil it down to these three factors: (1) careful selection of the newest tool materials, (2) proper tool design, (3) accurately controlled heat treatment.

Continental is constantly testing these three factors in one of the toughest tests in industry: the rugged day-in, day-out torture of actual production in Ex-Cell-O plants.

The results of Continental engineering and testing will be evident in your own cutting tool operations. Call your Ex-Cell-O representative or contact Continental direct.

CTW

Continental TOOL WORKS

Division of Ex-Cell-O Corporation, Detroit 32, Mich.

56-47

TECHNITE®
high speed steel
band saw blades
• Faster speeds and feeds mean lower cost per cut
• High Speed steel stays hard, sharp and accurate
• Narrow kerf reduces waste, gives more pieces from stock
• Cuts stainless, high alloys, aircraft metals
• Available in regular or Shark Tooth

See Your Capewell Distributor

CAPEWELL

THE CAPEWELL MFG. CO.
HARTFORD 2, CONN.

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Correction on sparks

Dear Sirs:
We noticed the comment in your "Letters" column (*AM*—Oct 6 '58, p 58) to the effect that Sparcard equipment for hardening tool bits is not available in the US.

Please note that this equipment is in fact available in the US through Easco Products of P O Box 587, Ypsilanti, Mich.

You may also wish to record that Easco Products sells our Sparcatron spark erosion equipment.

G V O'Brien
Impregnated Diamond Products Ltd
Gloucester, England

Fasteners

Dear Sirs:
Referring to your Special Report No. 464 on "Fastening Devices" (*AM*—Sept 8 '58, p97), will you please advise where we may contact the company specializing in Plasti-Rivets, as shown on page 100?

We are interested in receiving one of their catalogs and some samples and would appreciate any information you may be able to give us.

J F Campbell
Hamilton, Ontario

The Plasti-Rivet is manufactured by Fastex Division of Illinois Tool Works, 195 Algonquin Road, Des Plaines, Ill—Ed.

Dear Sirs:
We have read with great interest your excellent article on "Fastening Devices" . . .

Wartsila-koncernen A/B
Vasa, Finland

Dear Sirs:
. . . Could you give me the name of the manufacturer of the Banc-Lok Insert shown on page 107?

R S Curra
North Berwick, Maine

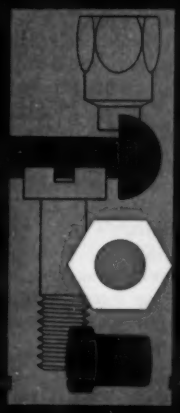
The Bank-Lok Insert is a product of Boots Aircraft Nut Co, Newton Turnpike, Norwalk, Conn—Ed.

Dear Sirs:
. . . I was particularly interested in the fact that you omitted any

SHOPMATES

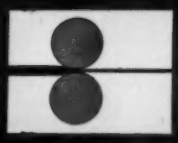
N. Jarvis

WELL--- FIRST I --- WE --- ER--- UH SWEEP THE --- ER--- TO SQUARE THE --- THE --- ER---
THE WHIP TOLD THAT NEW GUY TO LEARN HOW WE SET UP A JOB--- ALL HE'S GONNA LEARN FROM MAC ULCER IS HOW TO STUTTER AN' STAMMER!
N.J.JARVIS



COLD HEADING MACHINERY

Cold Headers • Parts Formers • Nut Formers • Slotters • Threaders • Pointers • Trimmers and other Cold and Hot Forming Equipment



ROLLING MILL MACHINERY

Two-High and Four-High Mills • Special Mills • Sendzimir Mills • Rod Mills • Slitters • Coilers • Winders • Straighteners • Payoffs • Edgers • Coil Boxes • And Other Mill Equipment

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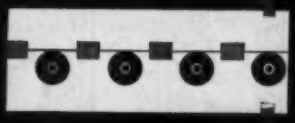
MACHINERY BUILDERS

WIRE MILL EQUIPMENT

Continuous Tandem And Upright Cone Wire Drawing Machines • Bull Blocks • Wire Flattening Mills •



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Cam and Crank Eyelet Machines • Horizontal Redraw Presses • Multiple Plunger Pillar Presses • High Speed Blanking Presses • Collapsible Tube Equipment • Ammunition Machinery, etc.

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DIVISION OF TEXTRON INC.
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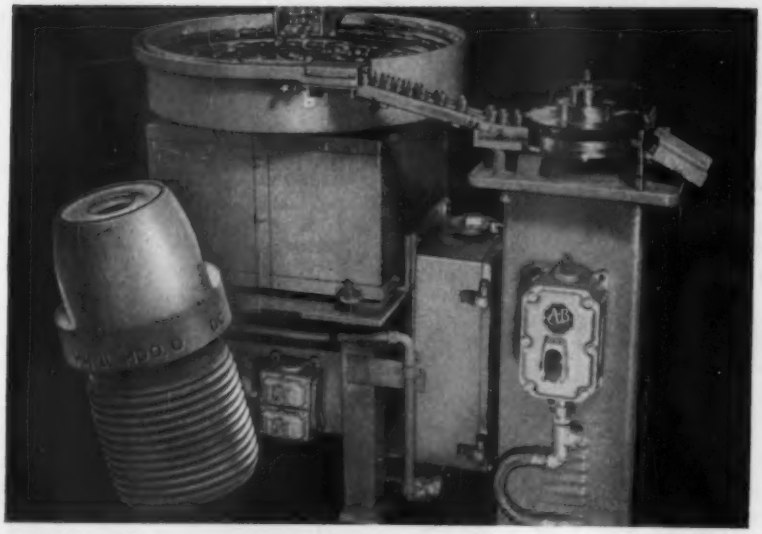
WF 51R



Automation
IN MARKING

MARKS
7500 PIECES
PER HOUR

Capable of speed-marking 7500 parts per hour, this hopper and dial feed machine is just about the nearest thing to automation in marking. As illustrated above, Model 435 features a vibratory parts feeder, 30" bowl and dual track carrier. Parts are fed to the machine from the bowl, then permanently marked and automatically ejected. Spring pressure controls depth of mark and insures clear uniform imprint. Ideal for speed-marking solid, round heavy walled or conical parts. Like all Noblewest Roll Marking equipment, it produces permanently indented impressions . . . good for the life of your product . . . at *faster speed and lower cost.* This is but one of Noblewest's comprehensive line of machines for marking round, flat, and irregular surfaces. For detailed information or catalog write Noble & Westbrook Manufacturing Company, 17 Westbrook Street, East Hartford 8, Connecticut.

Noblewest is equally famed for tools, fine marking dies, and fixtures.

A FEW DESIRABLE TERRITORIES OPEN TO QUALIFIED REPRESENTATIVES

MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES
NOBLEWEST
ORIGINATORS OF THE ROLL MARKING PROCESS
MARKING
NUMBERING
EMBOSSING
GRADUATING

reference to the fasteners manufactured by us.

Major metalworking firms have found Graham fasteners valuable for use with thin, non-ferrous pieces where no mark is desired on the prime face. I think your omission of Graham fasteners would be significant in the minds of many fastening engineers.

Sterling McKittrick, *Vice Pres*
Graham Manufacturing Corp
Needham Hgts, Mass

We collected the information for this Special Report from as many sources as we could find, and we are very sorry that Graham fasteners were not included—Ed.

Dear Sirs:

. . . This article has already been requested by many of our engineers. Do you have reprints of it, and if so, could you send us several copies? Our engineering staff would very much appreciate whatever you can do in this respect.

This is a fine article, and we plan to keep our copy of the Sept 8 issue of *American Machinist* on file in our Technical Library.

Alice Cheney
Hycon Mfg Co
Pasadena, Calif

Copies of the Special Report on "Fastening Devices" are available at 35¢ per single copy. Other American Machinist *Special Reports are also available, and our Reader Service Dept will be glad to furnish a list of titles and prices*—Ed.

Helpful Henry

by L Hoppes

"This wash room door sticks! You've got to wham it sometimes!"

CALENDAR

Society of Automotive Engineers —Annual Meeting and Engineering Display, Jan 12-16, Sheraton-Cadillac and Statler Hotels, Detroit, Mich.

Plant Maintenance & Engineering Conference, Jan 26-29, Public Auditorium, Cleveland, Ohio.

American Society of Mechanical Engineers — Aviation Conference, Mar 8-12, Statler-Hilton Hotel, Los Angeles, Calif.

American Society for Metals — Western Metal Exposition and Congress, Mar 16-20, Pan-Pacific Auditorium and Ambassador Hotel, Los Angeles, Calif.

Society of Automotive Engineers —National Production Meeting, Mar 19-20, Sheraton-Cadillac Hotel, Detroit, Mich.

American Machine Tool Distributors Association—Spring Meeting, Mar 19-20, Sheraton Park Hotel, Washington, DC.

Society of Automotive Engineers —Aeronautic Meeting, Production Forum, and Dislay, Mar 31-Apr 3, Hotel Commodore, New York, NY.

American Welding Society—Annual Convention and Meeting, Apr 6-10, Sherman Hotel and Donovan Hall, Chicago, Ill.

American Society of Mechanical Engineers—Metals Engineering Conference, Apr 29-May 3, Sheraton-Ten Eyck Hotel, Albany, NY.

American Foundrymen's Society —Engineered Castings Show, Apr 13-17, Sherman and Morrison Hotels, Chicago, Ill.

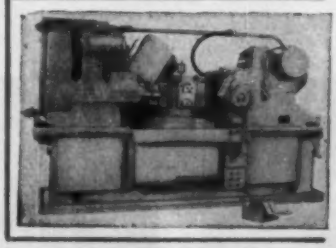
American Society of Tool Engineers—Annual Meeting, Apr 18-22, Schroeder Hotel, Milwaukee, Wis.

National Tool & Die Manufacturers Association—Spring Meeting, May 2-5, Statler Hotel, Washington, DC.

American Society of Mechanical Engineers — Production Engineering Conference, May 12-14, Statler-Hilton Hotel, Detroit, Mich.

Single set-up covering **ALL** finishing operations...

MEANS GREATER ACCURACY with **GOSS DeLEEUW**



AUTOMATIC CHUCKING MACHINES

One of the many important advantages being realized with this new chucker is the performing of ALL finishing operations on a single chucking of the work. In addition to the time saved, this feature, exclusive with Goss & DeLeeuw "1-2-3" machines, means only one handling of the work with an attendant greater accuracy. This machine is in a class by itself in precision finishing.

In Goss & DeLeeuw "1-2-3" Automatic Chucking Machines, one, two, or three ends of the work are machined simultaneously or in sequence. There is no need for resetting, retooling or secondary operations. More work from one machine and greater accuracy are matters of record.

Ask for illustrated literature describing the operation of this chucker in detail. Send samples of your work for time and cost estimates.

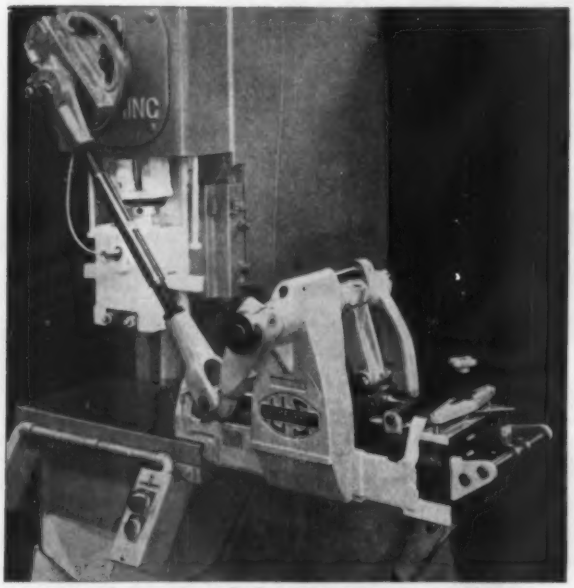
GOSS & DeLEEUW — QUALITY PRODUCT-QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

Automatic Feeding for punch press profit!

Short run jobs—produced with long-run economy on the new U. S. SLIDE FEEDS.

NEW U. S. SLIDE FEED features reduce press room costs . . . increase production because . . .



Special S. F.-68A U. S. Slide Feed. Set-up for Feeding right to left on press with front to back crankshaft.

LESS TIME NEEDED FOR CHANGEOVER.

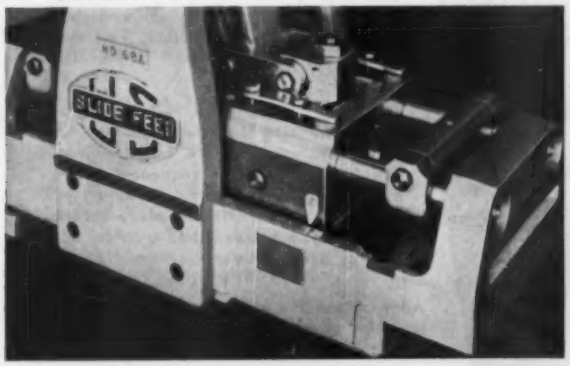
QUICK, VISUAL FEED LENGTH SETTING.

SIMPLE STOCK THICKNESS ADJUSTMENT.

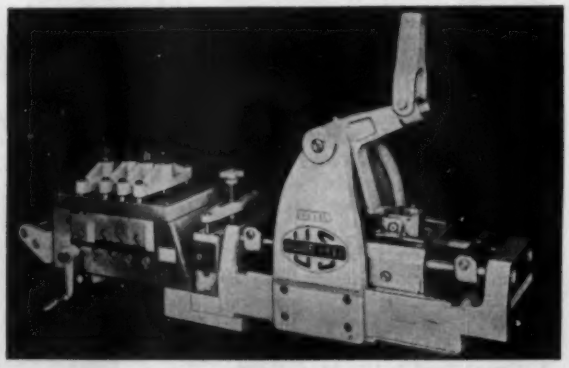
UNSURPASSED ACCURACY
(with or without pilots).

MORE POSITIVE CHECK.

Close-up of S. F.-68A U. S. Slide Feed showing indicator on feed block and scale on body, used for rapid feed length adjustment.



S. F.-68A U. S. Slide Feed with S. S.-27 U. S. Plain Stock Straightener. Conventional arrangement for feeding from left to right.



For complete information about the new U. S. Slide Feeds, write for Bulletin No. 101. Information concerning other U. S. Press Room equipment is yours by asking for Bulletin No. 85A.

PRODUCTS

U. S. TOOL COMPANY, INC.

AMPERE *(EAST ORANGE)* NEW JERSEY

U. S. Multi-Slides® • U. S. Multi-Millers® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories

CIRCLE 238 READER SERVICE CARD

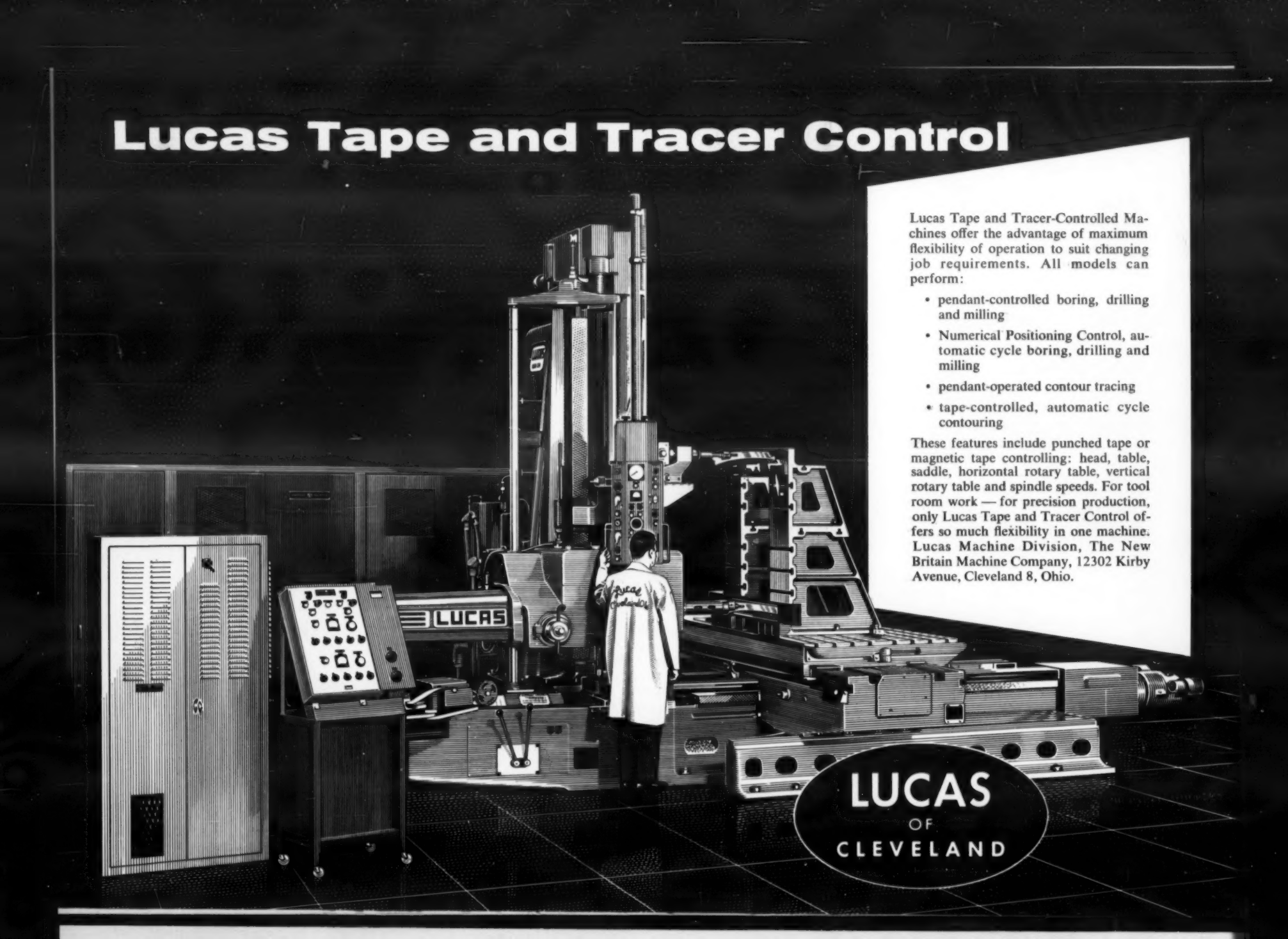
CIRCLE 239 READER SERVICE CARD ►

A New Lucas Lathe

Fully-automatic Tape Control, Tracer Control or both. Infinitely variable speeds and feeds. Automatically-maintained, constant-cutting speeds on changing diameters. Console control from moving operator's platform. *Three* hardened and ground ways. Self-contained Motor Generator Set.

The Lucas Lathe — perfect for your large, lightweight, close tolerance, intricately-shaped problem jobs. Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland 8, Ohio.

Lucas Tape and Tracer Control



Lucas Tape and Tracer-Controlled Machines offer the advantage of maximum flexibility of operation to suit changing job requirements. All models can perform:

- pendant-controlled boring, drilling and milling
- Numerical Positioning Control, automatic cycle boring, drilling and milling
- pendant-operated contour tracing
- tape-controlled, automatic cycle contouring

These features include punched tape or magnetic tape controlling: head, table, saddle, horizontal rotary table, vertical rotary table and spindle speeds. For tool room work — for precision production, only Lucas Tape and Tracer Control offers so much flexibility in one machine. Lucas Machine Division, The New Britain Machine Company, 12302 Kirby Avenue, Cleveland 8, Ohio.

SPOT NEWS...

- **It is extremely unlikely that any standard U S auto** will have an aluminum engine in 1960, despite widespread rumors to the contrary. Reason: no tooling has been ordered to date, and time is getting short (see p77).
- **Wide range of applications for ultrasonic welding** are expected to open up soon with marketing of a more powerful welding unit (4000 watts) and a portable welding unit that can operate up to 150 ft from the generator. Aero-projects Inc, West Chester, Pa, is the manufacturer.
- **Reinforced plastic motor boats that look like Chevrolets on water** are reportedly being readied by Chevrolet and Fisher Body. It's rumored the boats will be introduced at the New York Show, then marketed by Chevrolet dealers.
- **Current trend in commercial aircraft production** is toward very high engineering content in components, and very little shopwork (short runs of highly engineered parts). Parts makers as a result must do large amounts of engineering work just to reach the proposal stage—and if the maker loses the job, he is out of pocket for a considerable sum.
- **Parts shortages, an aftermath of local strikes,** are today forcing automakers to ship parts by air to keep lines going.
- **New "free state" titanium welding process,** developed by Solar Aircraft, Des Moines, feeds argon gas into cups located above and below the seam. Cups are filled with steel wool, are faced with porous bronze, which diffuses the gas and spreads it over the weld area. System also works on 8630 steel and 410 stainless.
- **Ford Motor Co will introduce an economy car on the U S market** when it feels it can sell "150,000 to 200,000 units annually," Henry Ford II told a press conference at the Ford plant in Cologne, Germany. Such a car, when and if it comes, will be big enough to carry a family of 5 or 6 comfortably. That means it will be bigger than present European small cars.
- **Is the age of the electric automobile dawning?** Stinson Aircraft claims to have licked the storage battery problem, is tooling up to produce an 1875-lb electric 'Charles Town-About" in 1959 to sell in the $2000-$2500 bracket. It'll be a two-door coupe capable of doing 77 mph. Another boost to the electric auto may come from Lockheed Aircraft's new smaller-than-a-basketball "fuel cell," which can produce 10 to 30 times as much energy as a conventional battery.
- **New tape-controlled multiple-torch Heliarc spotwelder** at Convair-Pomona is being used on Terrier missiles to weld four parts simultaneously. Process is also adaptable to semi-automatic production programming.
- **Russia now claims to have an intercontinental ballistic missile** in production. This news was buried in a single line of an 88-page outline of Russia's new Seven-Year Plan. And the same paragraph states "Preparations are now being made for travel to celestial bodies."
- **Some 5152 machine tools were donated to the nation's schools** for training purposes in the first three quarters of this year. More than half the total of these machines, which originally cost $9.5 million, was made available during the third quarter.

Spot index to major News stories...

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For Top Thread Rolling Performance

ON SCREW MACHINES AND AUTOMATIC LATHES

REED THREAD ROLLING ATTACHMENTS

Full Capacity Range

Standard and Special Sizes

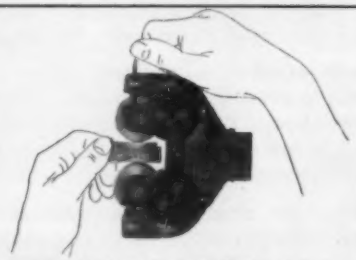
Self Compensating Roll Action

Simple Precise Matching

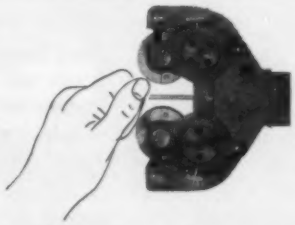
simple to set up and operate

The Reed Series B Thread Rolling Attachment reduces set up time considerably by simplified adjustments and more rapid installation on the machine. The exclusive set up features eliminate inaccuracies in set up resulting in superior performance. There are five basic steps in set up and operation. Each is quick and accurate.

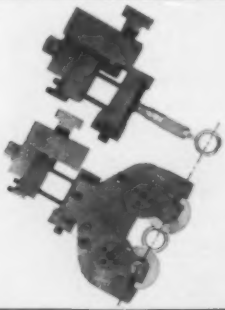
1. Assemble Rolls in Head— by simply removing roll spindle and inserting roll. Straight and taper rolls are readily interchangeable. No other equipment is necessary.



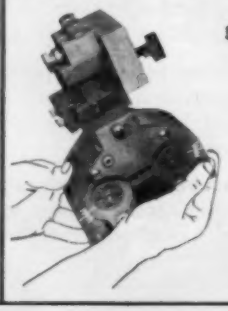
2. Establish Proper Roll Spacing— by adjusting arms equally until both rolls contact suitable gage. Graduation marks assure accurate adjustment of arms.



3. Match Rolls Accurately— by turning micrometer adjusting screw with hex key. This simple precise method of matching can be easily done without removing attachment.



4. Establish Position of Attachment on Machine— with micrometer forward positioning gage. Only one gage is needed for each size attachment and may be used for all thread sizes within capacity range.



5. Assemble Head to Adapter— by means of a quick dovetail connector. This exclusive design feature assures positive location of head with the work after changing rolls.

With the proper rate of feed, the machine can now be operated and slight adjustments in match or for thread size can be made easily on the machine if needed.

Write for your copy of Thread Rolling Attachment Bulletin B-2 for helpful information on Thread and Form Rolling

REED ROLLED THREAD DIE CO.

Specialists in Thread and Form Rolling Tools and Equipment

WORCESTER 1, MASSACHUSETTS, U.S.A.

Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

TRA—172

CIRCLE 341 READER SERVICE CARD

WASHINGTON...

Military budget outlook . . .

The administration's stern economy efforts are centered on the Pentagon where Defense Dept planners are now in the last round of the annual frenzy over the military budget.

The goal is to hold defense expenditures in fiscal 1960, starting next July 1, to the $42-billion level. This is some $1.2-billion over the current rate of spending. But to keep the spending increase to this sum, the administration will have to wield a sharp axe. Initial money requests from the three Services added up to several billions over the goal.

In trying to explain how the reins will be pulled on spending, Defense Secretary McElroy started off a round of confusing news reports two weeks ago about an alleged shift in defense strategy.

Basic defense policy unchanged . . .

There's been no shift in the Pentagon's defense strategy. Here is what it's all about:

McElroy hinted strongly that production of the Air Force's land-based IRBMs will not be substantially hiked next year (as some people in industry wishfully expected). Output will continue essentially at the present low volume.

The current schedule calls for about 10 overseas squadrons—no more than three of them equipped with the Chrysler Jupiter. When production to meet requirements for these units has been met, the program will be terminated.

At the same time, production of the Atlas ICBM will be substantially boosted next year. Development work on the follow-on Minuteman solid-fuel ICBM will also be accelerated. The Titan liquid-propellant ICBM will most likely continue at the current rate of R&D effort.

The IRBM decision does not represent a change in policy. Pentagon insiders have always said the land-based IRBM was just a stop-gap weapon until the ICBM becomes operational. IRBMs will have a bigger role to play, however, when tied to underwater or aerial launching systems. The underwater weapon system is already in production—the Polaris nuclear submarine. A solid-propellant IRBM capable of employment with mobile launching systems would also mean a more significant role for 1500-mile ballistic missiles.

More economy moves . . .

The administration has decided to stick by the 55,000-man cut in the Army and Marines set for this year—a plan Congress objected to—and the likelihood is that another reduction in force levels will be ordered for fiscal 1960.

A related decision involves the turndown of an Army plea to double the volume of conventional arms procurement—armor, small arms, troop-carrier planes, and the like.

The outlook is also for reductions in the output of manned fighter-interceptor planes next year and a corresponding increase in air defense missile projects—not necessarily in production rates but at least in R&D effort.

Still to be made are key decisions on the Navy's plea for a second atomic-powered aircraft carrier (the outlook is dim), the Air Force's request for another wing of B-52 bombers (odds are long), and the Navy's call for lots of additional funds for Polaris subs (almost a sure thing).

Congressional reaction . . .

The Liberal-Democratic gains in Congress (involving the election of serious defense policy critics and "big spenders"), combined with the administration's determined intent to hold military spending in fiscal 1960 to an increase of no more than $1 billion or so over fiscal 1959, makes it very likely that the defense budget next year will come in for the same kind of treatment in Congress that it had this year.

Congress will tack on extra money to the administration's military appropriation request, and the administration will decide not to spend much of the additional funds during the year.

This year's extra money . . .

This year, Congress tagged on $816 million. On policy grounds, the administration has definitely decided not to commit some of the extra funds before next July 1. On technological grounds, the administration has made no decision on the remaining additional funds—while sweating out progress on new research projects and evaluation of projects in the advanced development stage.

As already noted, for instance, the $97 million extra voted for the Army to maintain a larger force level than the administration plans (including sums for hardware procurement) will not be spent. Neither will the $136.1 million extra appropriated to the Air Force for procurement of troop-carrier aircraft.

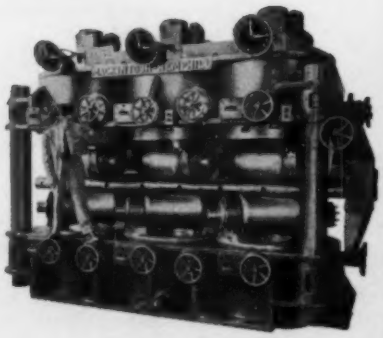
Still up in the air are decisions on what to do about the $123 million extra appropriated for the Air Force's Minuteman and Hound Dog missiles and the $492.6 million extra voted for the Navy's Polaris sub program.

...ALL SIZES STRAIGHTENED AND PERFECTLY ROUNDED ON MACK-HEMP ROTARY TUBE STRAIGHTENERS

Tubes of any alloy in any O.D. from .050-inch to 16 inches are production straightened and rounded at speeds up to 800 feet per minute or better. The six driven rolls are fully adjustable to suit tube diameter, amount of straightening bend needed, and correct contact grip on the tube. The machine operates without speed-limiting, surface-marring guides and the finished tubing shows no spiral markings.

All models—from the smallest to the largest—are now available in Mack-Hemp's exclusive new three-post construction.

For complete details of Mack-Hemp straighteners, write today for a free copy of our 24-page Technical Bulletin No. 55-A, "How to Straighten Pipe and Tube".



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Makers of the rolls with the Striped Red Wabblers

CIRCLE 242 READER SERVICE CARD

DETROIT...

Still no picture . . .

GM spokesmen during November would say no more than that sales look "good." Their pipeline was finally filled, but no report could be realistic until dealers have had a chance to sell from adequate stocks. The five divisions should start reporting their gains this week.

Total industry deliveries are still running slightly under year ago figures, despite claims of increases by individual makes. Yet, any survey of dealers—and there have been many—averages out to show that twice the number of cars could have been sold if they had been on hand.

Rambler and Ford, both with enough cars to provide a true sample, are holding steadily to their 176% and 43% gains, respectively, that were previously reported. Ford, in fact, is currently matching GM's industry penetration figure of around 33%, an alignment that can't last for long.

Hardest hit has been Chrysler, which went down for another week because of a strike of 8000 unionized white-collar workers, who, incidentally, already enjoyed salaries ranging from $300 to $900 a month. The militant typists, clerks, and draftsmen finally went back to work after being granted a contract similar to pattern, except that they have job transfer rights at five year's seniority instead of 12.

On the bright side, though, are strong indications that struggling Studebaker-Packard is solidly back in business. Dealer orders for its new Lark are already approaching 75% of the complete 1958 model run, which totaled 52,392 passenger cars. It is reliably estimated that S-P's break-even point is somewhat below 100,000 units annually. The company has lost more than $22 million during the first nine months of this year.

Cabs without meters . . .

Ending nearly two years of speculation and rumor, Checker Motors Corp has announced that it will begin producing a family-type passenger car, the "Superba," by mid-December. The 7-passenger 120-in.-wheelbase auto will be essentially similar to the firm's familiar taxicab model except for more chrome and—fortunately—softer seats and springs.

Detailed specifications haven't been released, but it is understood that the car will be powered by a Continental-made, 140-hp OHV six, with an automatic transmission available for those who wish it. Despite the relatively long wheelbase, overall length is less than that of Fords, Chevrolets, and Plymouths. Checker President Morris Markin says that production lines in the Kalamazoo plant are geared for 100 Superbas a day, in addition to cab output. The car can be purchased through dealers in most metropolitan areas for around $2500.

Revolution in trucks . . .

Two makers, White and GMC, have recently announced cab-over-engine highway tractors that presage a revolution in truck design. The cab of the new "Jimmie" is of all-aluminum construction which, combined with an SAE high-tensile steel frame, produces weight savings that translate into from 699 to 2097 lbs. more payload capacity. The tractor is equipped with air springs on all wheels. When volume production begins in January, the unit will feature a choice of new Detroit Diesel Division engines with a horsepower-to-weight ratio double that of previous designs.

The new White series "5000" comes with an all-fiberglas cab strong enough to need no metallic bracing, except for an aluminum underframe.

Aluminum engines for 1960? . . .

Despite shovels full of rumors to the contrary, it is very unlikely that any standard-sized 1960-model car of American manufacture will be powered by an aluminum engine. The simple reason is that neither new nor reworked tooling has yet been ordered for this purpose, and it is now pretty much too late.

Also it is not likely that a change of this magnitude would be made in the middle of a model run. An aluminum engine just can't be put into an existing auto designed to carry the weight of cast iron. For example, a typical 6-cyl bare block weighs about 40 lb which is some 130 lb lighter than its cast-iron counterpart.

Present-day cars with their heavy V-8 engines, have a weight distribution somewhat akin to that of a blackjack. A move to aluminum engines, while desirable from a handling standpoint, would require complete re-engineering of the suspension and steering geometry and the problem would be further compounded by simultaneous adoption of a trans-axle.

In any case, aluminum blocks when they come will be die castings. Injection molds capable of doing the job are in existence and can produce in auto industry volume for about 30¢ per lb, a saving of at least 40¢ over sand castings and 14¢ over permanent mold methods.

51% More Production

when drilled with the

BENCH MODEL BURGMASTER®
Turret Drilling Machine

JOB DATA:

Part: Gas furnace pilot burner head.

Location: General Controls Co., Glendale, Calif.

Material: Type 2202 stainless steel.

Operation: Drill 10 holes No. 56 drill size.
Drill 1 hole No. 42 drill size.
Drill 1 hole No. 37 drill size.

All hole positions indexed radially around jet axis. Turret is double tooled.

Former Method: Production—58 pieces per hour, standard, on a 3 spindle gang drill. Fixture was progressively moved from one spindle to the next on 8' table.

Burgmaster: Production—88 pieces per hour, standard, with actual production running 130% over standard. Operator fatigue greatly reduced. All holes now drilled from one operator position on a stationary rotating fixture. Floor area requirements per machine reduced 50%. Based on savings alone this machine paid for itself in less than 5 weeks!

Paid for itself out of savings in less than 5 weeks!

THE BURGMASTER TURRET DRILLING MACHINE speeds all second operations—*center drills, drills, reams, taps, spot-faces, countersinks,* and *counterbores!*

SELF-INDEXING—Turret instantly power-indexes to successive station after each individual operation is completed!

6 STATIONS—Only one live spindle! Each spindle operates at its own predetermined speed. Two complete ranges cover 350 to 6200 rpm.

¼" CAPACITY IN STEEL—Larger hole sizes in softer materials.

For *more* parts per hour, for *lower* costs, put your second operations on a BENCH MODEL BURGMASTER TURRET DRILLING MACHINE! Here's a tool that not only produces more parts faster...it costs *far less* than conventional equipment often used for the same job! Write for circulars and specifications!

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AIRCRAFT and MISSILES...

TRENDS

Missile management questioned . . .

Ballistic missile contractors are waiting to see what, if anything, happens to Air Force procurement policy as a result of the Air Force Inspector General's critical report on management of the Ballistic Missile Program (see p 95).

Pentagon officials refuse to comment on the report. But it seems obvious that there will be some kind of tightening by the Air Force's Ballistic Missile Division of administration and auditing of Atlas, Titan and Thor contracts.

Space capsule bids wanted . . .

December 4 is the deadline for companies to make bids to the National Aeronautics and Space Administration for design and fabrication of manned satellite space capsules. To date, bids are expected from some 30 companies, which were represented at NASA's recent industry briefing.

Initial cost estimates run to $130 million for at least eight test capsules and related subsystems, to be used at first for small-animal and instrument test flights. The capsules are expected to be seven-ft-wide, cone-shaped vehicles weighing about 2200 lb. They will be launched into space by modified Thor or Atlas missiles.

Employment stability in 1959? . . .

Employment outlook, as reported by the nation's major aircraft plants, is that employment will continue to drift downward very slowly until the end of the year—then will stabilize itself at least through 1959.

Lockheed Aircraft, for example, expects its employment to bottom out at 50,000 by the end of the year. About 18 months ago there were 62,000 on the company's rolls. The California Division fell from 32,000 in mid-1957 to what is expected to be a leveling-off point of 18,500 by 1958's end. Conversely, Lockheed's Missile Systems Division shot up from 5100 in mid-1957 to a current 14,500, is expected to rise another 10% in 1959. Lockheed's Georgia Division fell from 19,000 to 4000 in 18 months, is expected to stay at 4000 throughout 1959.

Northrop Aircraft hit a low of 19,450 in August, and indications are that a leveling-out has already begun.

North American, the first company hit under the drastic Navaho missile cancellation in 1957, expects some further decline in employment, but the long-term outlook is upward. Latest employment figure for all divisions is 54,971, compared with 50,547 a year ago—but almost all of the rise can be attributed to the company's Missile Division. Also anticipating new hirings in 1959 are the Atomics International, Autonetics and Rocketdyne Divisions.

The last propeller-driven commercial transport has just come off Douglas lines at Santa Monica, ending 26 years of this type of production.

As DC-6s and DC-7s have phased out, workers have gradually been let go, with most of them reassigned to missile work. Consequently, the termination of contracts will not throw large numbers of aircraft workers on the market.

UAW settles with Temco . . .

Members of UAW unions at Temco Aircraft's Dallas and Garland, Texas, plants have voted by more than a 2 to 1 margin to accept a two-year contract calling for wage increases ranging from 22¢ an hour for top labor to 5¢ an hour for the lowest. The new contract also calls for upgrading of some employees, a cost-of-living escalator clause, and an automatic 3% boost next year.

Germany ups military output . . .

West Germany has just taken two **giant steps** along its long road back to military aircraft manufacturing eminence.

First is the authorizing of $450 million for the purchase of 6 to 10 Lockheed Starfighters and a license to produce them, and for a similar purchase and licensing arrangement for Italy's Fiat G-91 and France's Alouette helicopter.

Under terms of the Lockheed agreement, Germany would build 300 under license, changing configurations to make them into interceptors, fighter-bombers and photo-recon planes. Messerschmidt and Heinkel are slated as chief primes.

Second, Rolls-Royce jet aircraft engines will be built in Germnay under license by M A N Turbomotoren GMBH. Probable first use of Rolls-Royce engines will be in o proposed 40-ton turbo-prop transport for the German Air Force.

JetStar coming out . . .

Production of tht 600-mph "economy sized" JetStar is now starting at Lockheed Aircraft's Marietta, Ga, Division. First delivery of the swept-wing jet utility transport will be made in obout 18 months. The JetStar seats 10 passengers, comes with either twin Bristol Orpheus engines or four Pratt & Whitney JT-12s, or four General Electric J-85s—choice is up to the customer.

Modern celestial navigation systems for sophisticated jet bombers use the Simulacrum astro-tracker test table pictured above. The Alignment Fixture for this intricate instrument establishes a point to simulate a star . . . and the alignment calibration must be accurate to one second of arc, for an error as small as one second could result in serious inaccuracies. Consequently, the machining of the Alignment Fixture must be accomplished with extreme precision, as pictured in the finish milling of the critical bearing surfaces at the B. G. Instrument Corporation of Corona, New York.

SIP

Production with precision

When the job consists of a variety of operations on so critical a part as the Alignment Fixture for the Simulacrum, it is all but mandatory to machine it on the SIP HYDROPTIC. For work of this character, the ultimate in precision is maintained . . . axial centers must be absolutely "dead accurate" (within a tenth) . . . and all bores and locating surfaces must be within an accumulated error not exceeding 0.0005".

Here you see the machining of this Fixture in progress—on the SIP HYDROPTIC 6A Jig Boring and Milling Machine . . . in the temperature-controlled jig boring room of the B. G. Instrument Corporation of Corona, New York.

In the new series of HYDROPTICS . . . featuring greater ease of operation, increased range and capacity, and a guaranteed visual accuracy of 0.00015" . . . the basic Precision that is SIP assures confidence whenever critically accurate machining is demanded. Catalog No. 1149 tells the complete story of the SIP HYDROPTIC 6A; send for it.

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HIGH PRECISION MACHINE TOOLS & MEASURING EQUIPMENT

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MACHINE TOOLS...

Shipments from U S plants abroad?

When will a U S machine tool builder, with European or other foreign manufacturing facilities, begin shipping machines back here for sale in the domestic market?

This question is being asked repeatedly in machine tool circles. Because of the sharp difference in labor rates, machines can be built abroad at a much lower cost than here.

At least one builder has manufactured in France a standard machine of a type and size for which the U S demand is very small and shipped it back to its home plant for a final going-over before it is delivered to a buyer here. Even after paying duty and after having the added expense of handling and work at the home plant, the total cost is less than if the machine had been built here.

This is a special case, however. If the builder could not produce this particular model abroad, it would not make it at all. It can utilize its own U S facilities more profitably building other types of machines.

Some U S builders are shipping into Canada machines that they have made in Europe. The quantity, however, is believed to be relatively small. This practice enables U S companies to compete in price with British and Continental European builders in standard machine tools.

An important domestic builder is reported to be shipping machines to U S customers from its Canadian plant. Production savings are enough to make this a profitable venture.

A Canadian builder at the same time is continuing to ship transfer and other high-production machines to automotive customers in Michigan.

Net orders show healthy gain . . .

October figures for metal-cutting machine tool orders proved a surprise, the month at $27.5 million ranking second only to March this year. The gain over September was a healthy 37%.

While the increase in domestic orders was impressive, from $18.2 million in September to almost $23 million in October, orders from foreign sources went up sharply, totaling $4.6 million. The long slump at home has made foreign business stand out.

Foreign orders this year have run about 18% of the total, whereas the average over a number of years has been around 10%.

Net orders for metal-forming machines, contrary to the situation in cutting-type machines, rose only a trifling amount to $8.2 million.

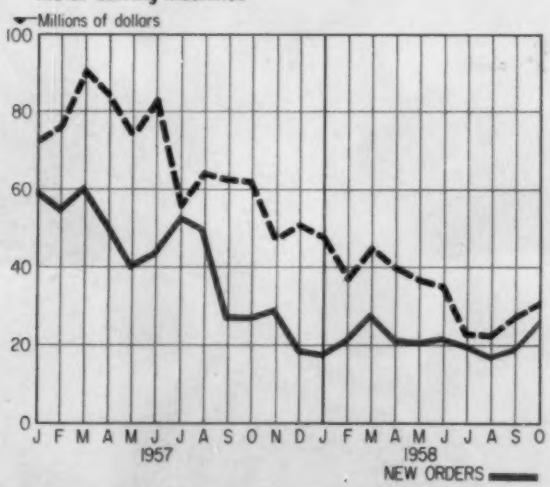
Indian builder seeks U S help . . .

Kirloskar Brothers Ltd, Kirloskarvadi, Satara, India, is soliciting financial aid from seven U S machine tool builders in constructing a factory to make a variety of U S machine tools under license.

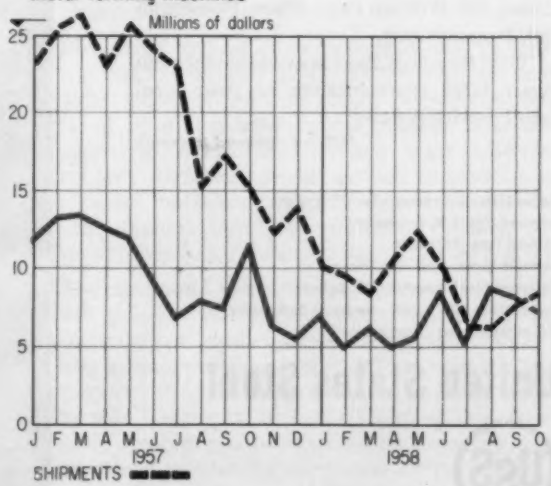
These machines would include millers, planers, shapers, slotters, cylindrical grinders, heavy lathes; mechanical, forging, hydraulic presses.

Company officials are in touch with U S builders through BDSA's Metalworking Equipment Division in Washington. They also expect to talk with the U S Trade Mission that has just arrived in India.

Metal-cutting machines



Metal-forming machines



* **Stainless Steel welding information:**

*Keep it clean

You get strong, tight joints when you weld Stainless Steel, but you have to make sure the surfaces have been thoroughly cleaned. Any grease, oil or dirt on the welded surface might affect the corrosion resistance of Stainless.

When you want to repair a crack, it's a good idea to chip out the cracked area completely so you're sure that only clean, solid metal is exposed. And remember, there are a lot of different kinds of Stainless Steel and they don't all react the same way. Be sure you handle each job right—check the "Stainless Steel Fabrication Book" before you start. If you don't have a copy of this 130-page guide, write on your company letterhead to United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS Stainless Steel is available through your USS representative or your local steel service center.

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American Steel & Wire—Cleveland
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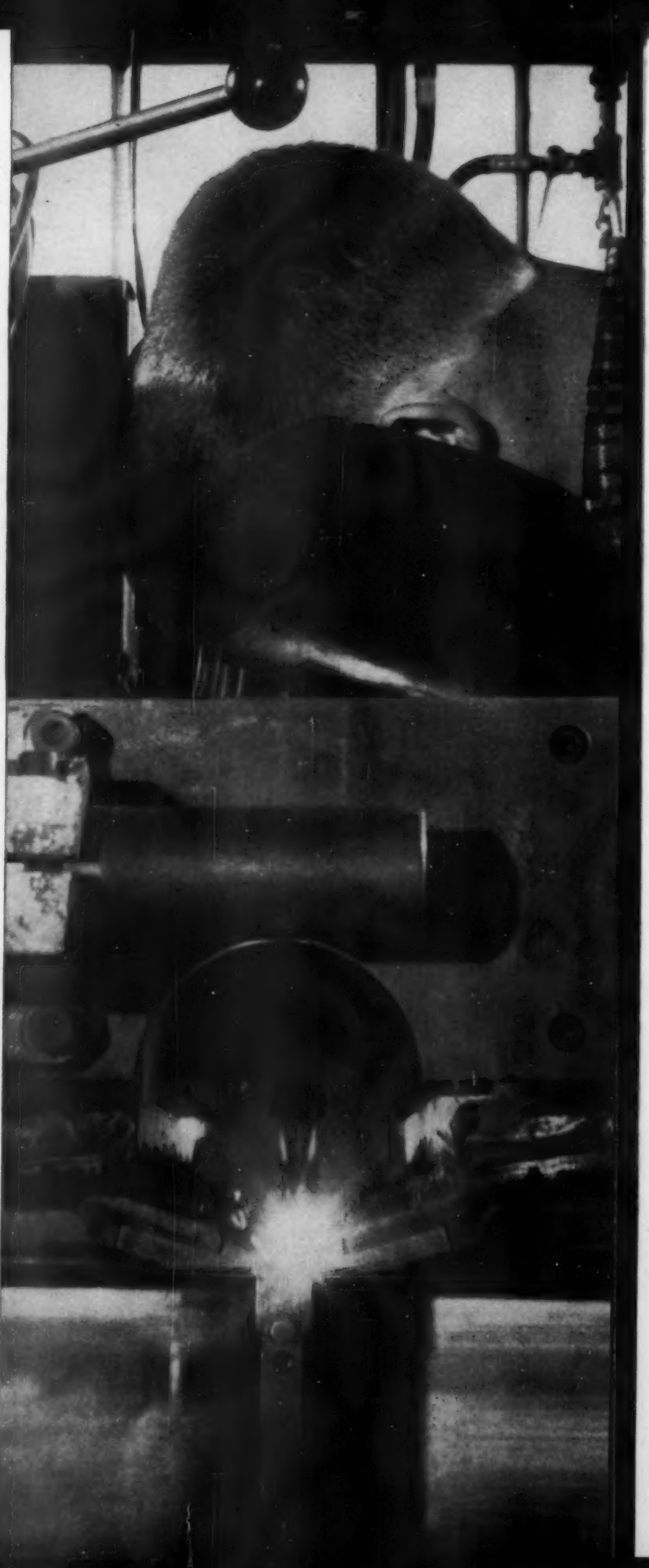
Columbia-Geneva Steel—San Francisco
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Supply—Warehouse Distributors
United States Steel Export Company

United States Steel

USS



MATERIALS... TRENDS

Broader reinforced-plastic uses . . .

New and distinctly different characteristics in molded reinforced plastic parts result from a new molding process according to its developers, The Cincinnati Milling Machine Company. Custom molding of reinforced plastics by this method, named the Cimstra Process, will be done by the company's newly formed Cimstra Division.

An outgrowth of the company's studies of plastic materials and processing methods, the process will provide molded parts as colorful as desired, varying through the entire range from black to white. Pigmented fibers can be molded with veins of the same shade, or of different shades.

Designers using these moldings are said to have much greater freedom in structural shapes. For example, varied cross-sectional thickness can be specified because the critical resin-reinforcement ratio will be maintained for needed strength. Sharp radii, flanges and intricate shapes, often troublesome or impractical with conventional reinforced plastics, impose no restrictions.

More on plastic spray-up . . .

Spray application of fiber reinforced plastic is made possible by the newly developed Gusmer spray system announced at the SPI exposition by Union Carbide Plastics Co.

Laminate is sprayed at the rate of two pounds per minute—1.3 pounds of epoxy resin plus hardener to 0.7 pounds of chopped glass roving—with the new system. Correct proportions of resins and hardener are assured through a positive metering system. These materials meet in the gun's mixing chamber where they are mixed and forced through an orifice at 300 psi.

A self-cleaning design leaves the gun ready for immediate use, even after standing overnight. Each layer is rolled after application to insure complete wetting and to eliminate pinholes. Mold costs are said to be very low.

New reinforcement . . .

Pure quartz has been produced in thread form by the General Electric Company. Industrial and defense applications are being studied. Principal use of the new thread probably will be as a woven cloth to reinforce plastic.

Higher temperature resistance is one of its attributes. It has been tested at temperatures above 5000 F, considerably higher than the melting point of woven glass. Strength characteristics are greater than those of asbestos, another common reinforcing material.

Low cost, more resistant . . .

Corrosion-resistant mild sheet steel is produced by a new process which applies furnace-bonded protective coating of super-thin metal alloy to the steel base. Named the Nicrocoat Process, the new method was developed by Wall Colmonoy Corp, Detroit. It also can be used to protect low-cost metals, such as mild steel, against oxidation and abrasion. Process is said to give corrosion and oxidation resistance normally found only in stainless steels and high-alloy metals. It provides better abrasion resistance than stainless steel.

Plasma-gun speculation . . .

Since publication of the plasma-gun article (*AM* —Nov 3 '58, p87) applications have been appearing on all sides. Engineers at Reaction Motors Div of Thiokol Chemical Corp speculated with AM's assistant editor Richard Berg that developments like the plasma gun keep pushing the impossible further into the future.

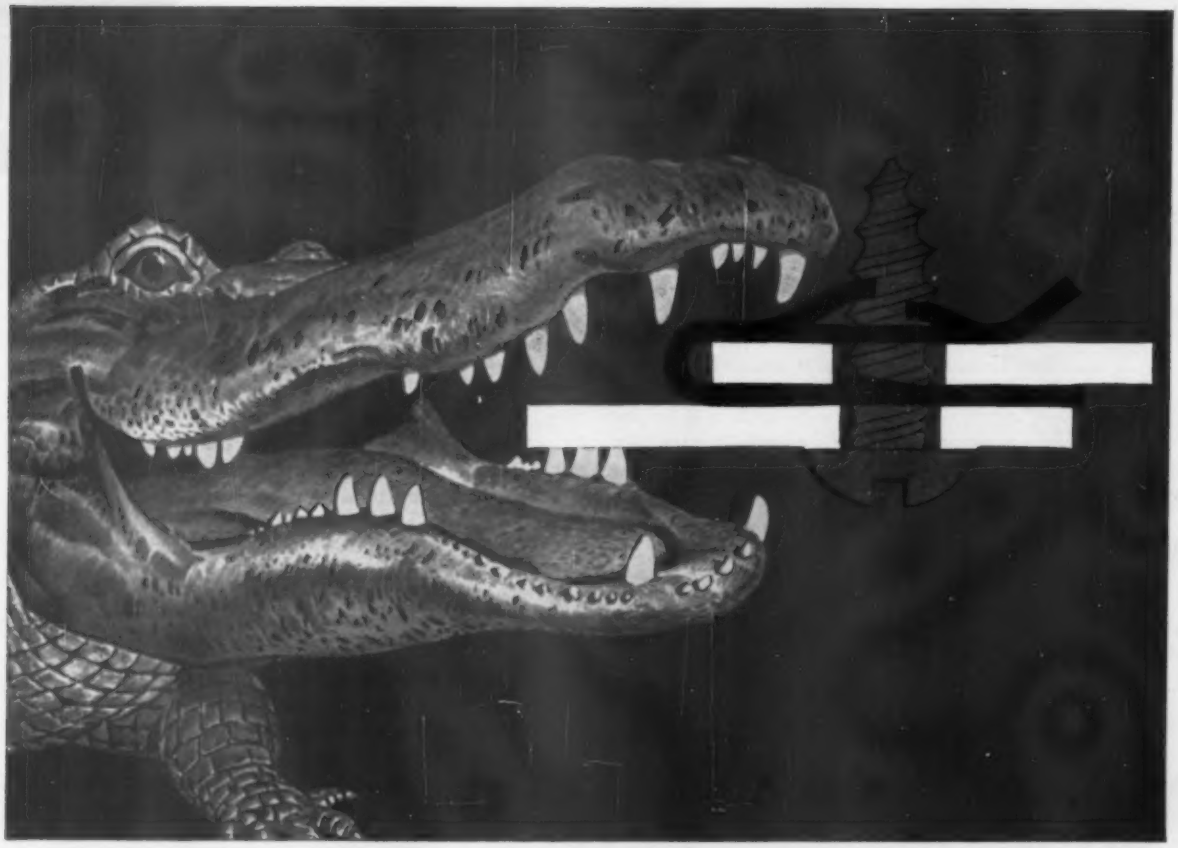
Suppose, they said, that a combination of elements was mixed as a vapor and at 20,000 F a new material precipitated out of the vapor. We then would have a material with a melting point above 20,000 F that could open up fantastic areas of development in space vehicle speeds and in industrial processes.

New anti-friction treatment . . .

The Progreg process is arousing world-wide interest. In less than one year the original British company has expanded to include thriving subsidiaries in other nations.

Developed by Scot John McGregor and his staff, the method consists of a treatment which provides molecular penetration of the treated material by a thermo-chemical process. It is designed to reduce friction and wear between rubbing surfaces; can be applied to practically all solid materials, including conventional metals, titanium, beryllium, tungsten carbide, ceramics, plastics, rubber, leather, glass and wood.

The compound can withstand pressures of 440,000 psi—but not greater than the underlying material can withstand—and provides protection at temperatures from –70 F to 1650 F. Cutting-tool life has been increased up to 30 times by this treatment. A Ford-Consul engine, similarly treated, ran 30,000 miles on a single filling of oil and practically no oil was lost.



STEEL JAWS THAT NEVER RELAX
fasten a fastener in place

Alligator jaws have nothing on Tinnerman "U" and "J" type fasteners in gripping power. These fasteners press easily into locked-on position over panel edge or center panel locations. Yet they provide positive self-retention, ending the need for welding, staking or other secondary fastening devices. They are ideally suited for blind assembly or hard-to-reach locations.

When combined with the familiar Tinnerman SPEED NUT, this unique fastening principle provides a one-piece, self-locking, self-retaining fastener that is fast and easy to apply. The "U" or "J" feature can be combined with wire and tube retainers, latches, catches and a host of other fastening requirements to save time, material and production costs.

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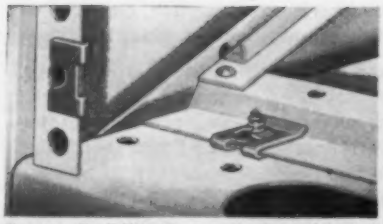
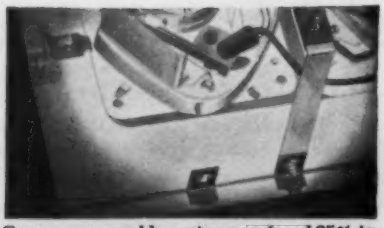


Greater flexibility for control equipment enclosures is provided by self-retaining "J" type SPEED NUTS at 30% less production cost.

Assembly costs on this sheet-metal skylight frame are reduced 66% by Tinnerman "U" type SPEED NUTS.



Gas range assembly costs are reduced 25% to 50% by using Tinnerman "U" and "J" type SPEED NUTS.

WHAT'S AHEAD... in Metalworking

TRENDS

Now . . . basic industry starts its comback . . .

Basic metalworking and metalworking supplier industries, traditionally slower to recover from the recession than the more volatile consumer durables industries, are at last beginning to pick up steam.

Basic steelmaking operations across the nation, for example, have reached their highest rate of the year—75.5% of rated capacity. Outlook for 1959 production is 20% to 30% above this year's levels, somewhere in the 102 to 110 million-ton range. Steel shipments to the auto industry alone should increase 50% for two reasons: (1) an anticipated 30% rise in auto output next year, and (2) a long-delayed buildup of automotive industry steel inventories. Increased demand is also expected from the construction, industrial machinery and oil country goods fields.

Gray iron foundry operations have hit the year's high water mark (60% of capacity), up from the year's low in July of 43.3%.

Steel foundry bookings, while still pegged well below 50% of maximum demand, are beginning to show an improvement.

Aluminum foundry operations, at least for the big shops, are well out of the recession hole. Recent inroads into forging and increased demand for aluminum automotive parts are responsible.

Screw machine products industry reports a significant upturn in new orders in the last five weeks—with business "up to normal levels for the first time this year." But the year as a whole will still be down 15% or so for most manufacturers—and profits down nearly 50%.

Automotive parts makers, while they are busy filling pipelines for new model cars, still aren't straining capacity. Orders are just now starting to come through from Detroit on a regular basis, but makers of parts are today still operating about 10% under expected levels. Business is expected to pick up decidedly at year's end, when auto strike troubles are over and the new models begin to really catch on with the public.

Aircraft parts makers are having their troubles: scheduling of manned military aircraft is fading, and there is little likelihood that output will ever return to the pre-cutback levels for which most parts makers are geared.

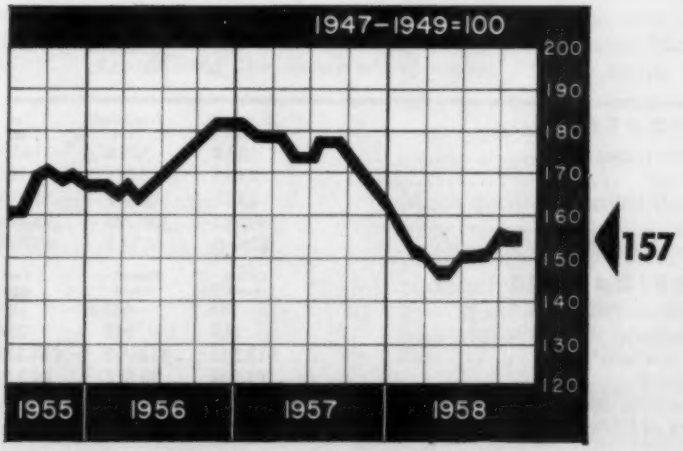
Military plane parts output is now down to about 60% of pre-cutback levels, and a substantial further decline is expected by second quarter 1959.

Tool and die business, while it has showed some improvement over August levels, still shows no upward trend of any strength—even though orders have picked up somewhat here and there, notably in the Chicago area, where business has increased from the appliance and farm equipment fields.

Stamping outlook, too, is still very spotty. Too many orders are "still in the hold file" to suit the stampers, and ordering is on the cautious side.

Many stampers report they are still operating day to day and none of the normal season patterns seem to apply this year.

The last month-and-a-half has seen a decided improvement in used machinery sales, ending a several-months-long sharp decline—in spite of a rise in used machinery price levels. Rebuilding has shown some signs of improvement in recent weeks, but backlogs are very low.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

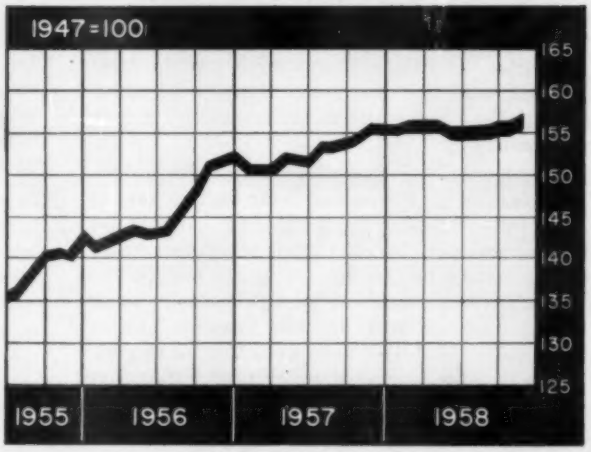
BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	NOV. Estimated	OCT. Preliminary	SEPT. Revised	OCT. Year Ago
Total Index	**157**	**156**	**156**	**169**
Machinery	130	130	130	146
Electrical Machinery	176	185	194	194
Autos	92	66	114	114
Other Transportation	345	374	346	346
Other Metalworking	142	141	142	142

TRENDS WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	NOV Esti-mated	OCT Pre-liminary	SEPT Re-vised	OCT Year Ago
Total Index	**156.6**	**156.4**	**155.8**	**154.7**
Metalworking Machinery	181.0	180.8	182.4	
Other Machinery exc. Electrical	166.5	165.9	165.1	
Electrical Machinery	158.9	158.8	156.9	
Fabricated Metal Products	147.0	146.2	144.9	



Inflation threat may be overrated...

The recent levelling off of prices suggests that inflation may not be as big a problem over the next six months as many experts seem to think. The threat of inflation is always with us. But at present and for the near future, has waned.

Actually the cost of living, as measured by the Bureau of Labor Statistics' consumer price index, declined in August, levelled off in September and held at the same level in October. With the introduction of the new 1959 car models during November, a small increase in the Index may be expected this month. But over-all, the price increase will probably be kept to a minimum over the next few months. Especially will this be the case during the winter when food prices, which account for roughly 30% of the index by weight, decline seasonally.

The all-commodity wholesale price index of the Bureau of Labor Statistics has been dropping since March. Between March and June the decline was centered in industrial prices. But since June falling farm prices have resulted in a further dip in the over-all wholesale index.

Industrial prices have firmed up in the last few months. The recovery in industrial production, which has seen consecutive gains in output since May, has contributed considerably to the firming up of industrial prices. As business activity spurted, companies began to increase prices of their products. At first it was very selective, with products in heavy demand getting higher price tags. Now it is somewhat more general. But there has been quite a bit of resistance to price increases. And for good reasons.

At present there is still some spare industrial capacity, as well as an excess of manpower. These two factors should continue to act as brakes on price inflation at least until mid-1959. At that time the operating rate of manufacturing firms, on the average, will be close to 85% of capacity. Also the total number of jobless people in the nation will have shrunk.

WEEKLY BUSINESS INDICATORS	*Latest Week*	*Preceding Week*	*Year Ago*
Business Week Index of Activity (1947-1949=100)*	136.6	137.0	140.2
Steel ingot operation (thousands of tons)	2,005	2,011	1,945
Electric power output (million Kilowatt hours)	12,378	12,311	11,953
Production of automobiles and trucks	149,960	158,138	173,383
Engineering construction awards (Eng. News-Record-millions)	$243.0	$374.3	$332.3
MONTHLY BUSINESS INDICATORS	*Latest Month*	*Preceding Month*	*Year Ago*
Index of industrial production (1947-1949=100)*	138	137	142
Index of durable manufactures production (1947-1949=100)*	145	145	156
Durable goods manufacturers' sales, millions*	$12,561	$12,385	$14,132
Machinery manufacturers' sales, millions*	$3,984	$3,817	$4,314
Durable goods manufacturers' new orders, millions	$12,597	$12,177	$12,519
Machinery manufacturers' new orders, millions	$4,223	$3,851	$3,952

* Seasonally adjusted

"American" TRACER LATHES

Bulletin
No. 135

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and shows many examples.
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American Machinist
MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

At Last It Has Happened

When you first see the figures, you rub your eyes and are inclined not to believe them. They just can't be true.

But the fact is that they are true. After a spectacular growth of 40% in the productive capacity of Metalworking the past five years, there are 235,000 fewer cutting-type machine tools and 20,000 fewer forming-type machine tools installed today in America's metalworking plants than in 1953.

These figures are not guesswork . . .

They emerged from *American Machinist*'s eighth Inventory of Metalworking Equipment published in our issue of November 17.

This phenomenon has never happened before —the number of machine tools shrinking considerably while the nation's production capabilities were sharply expanding. To be sure, there were fewer machine tools in Metalworking at the end of the severe depression of the 1930's than at the beginning. But that hardly counts.

Yet even a little study of the situation makes good sense out of what has happened. The past 10 years machine tools have been increasing in size, weight, horsepower, complexity, ability to perform multiple operations simultaneously. They are producing more in a shorter time—and that means greater productivity per machine.

A recent American Machinist survey

turned up the fact that machine tools of today's design are 54% more productive, on the average, than those of 10 years ago. And many machines have increased their productivity much more than that over comparable 1948 machines.

The automobile industry probably is the place where you first would look for confirmation of the "more-capacity-and-fewer-machines" trend. Detroit, more than anywhere else in the world, stands for mass production. And you would be absolutely right in choosing Detroit as the check-up point.

Five years ago the automobile industry had 220,000 machine tools installed in its plants. The total has shrunk to 164,000 today. Auto makers have enormously increased their capacity since 1953. They were the leading buyers of new machine tools, particularly the automatic, transfer-type units. As a result, they are able to handle the larger volume of output with 75% of the number of machines that they had five years ago.

But this is not the whole story of why Metalworking has fewer machine tools. The other part has to do with scrapping of superannuated machines. The past three *American Machinist* Inventories—in 1949, 1953 and 1958—show that the ratio of machine tools over 20 years old to the total has been steadily declining.

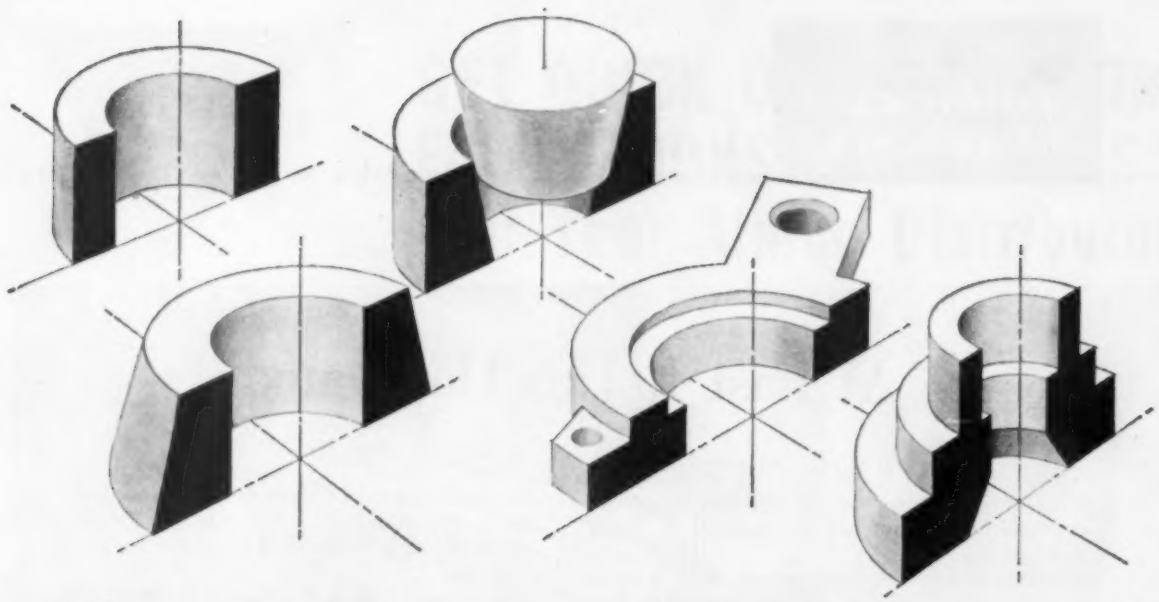
21% of cutting-type machines . . .

were over the 20-year line in 1949. Now the ratio is 16%. So some progress is being made in getting the old clunkers out of the nation's shops and onto the scrap heap.

What conclusion should one draw from all of this? It is a safe bet that in 1963, five years from now, the average machine tool of 1963 design will be a lot more productive than today's. And if the ninth *American Machinist* Inventory, due in 1963, should reveal further shrinkage in the numbers of machine tools installed in metalworking plants, don't be too surprised.

Remember that there is a relentless trend towards bigger, better machines that do more work. That is why productivity in U S Metalworking tops by far that in any other country in the world and why our superiority is sure to be maintained.

Burnham Finney EDITOR



when to consider Vertical Grinding

A simple test you can try for yourself quickly determines whether you should consider the Springfield principle of *vertical* grinding. Try it!

CHECK YOUR ANSWERS TO THIS QUIZ	YES	NO
1. Do you grind holes 4" in diameter and larger?	☐	☐
2. Do you grind taper holes or mating parts?	☐	☐
3. Do you grind on irregular shaped work?	☐	☐
4. Do you grind O.D. or I.D. shoulders, offsets, undercuts?	☐	☐
5. Do you grind pieces requiring extreme concentricity?	☐	☐
6. Do you require a 5 micro-inch or better finish?	☐	☐
7. Do some of your grinding jobs require many setups?	☐	☐

If you answer yes to three or more questions, a Springfield vertical universal grinder probably can save real time and money in your plant. Mail the coupon today for your free and informative copy of "Vertical Universal Grinders"; Bulletin 197-F.

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SPRINGFIELD

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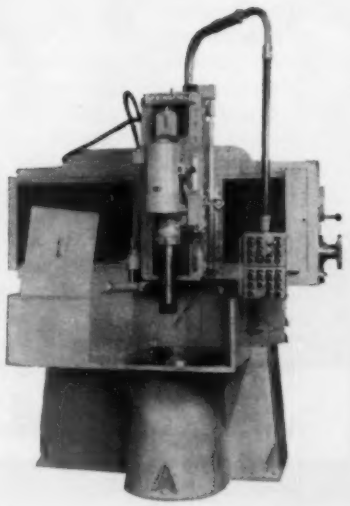
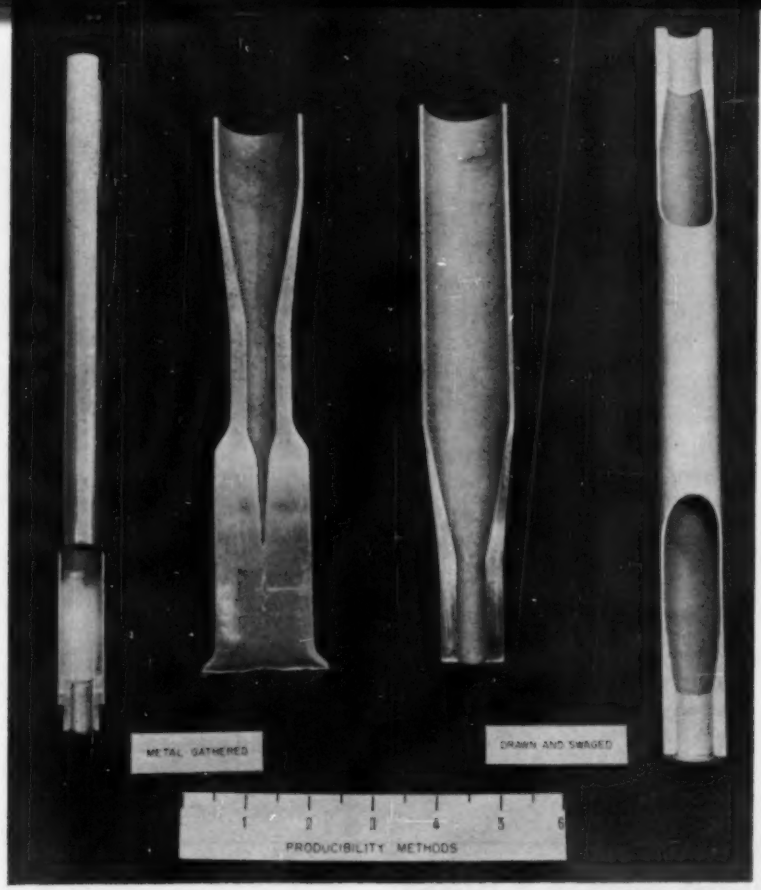
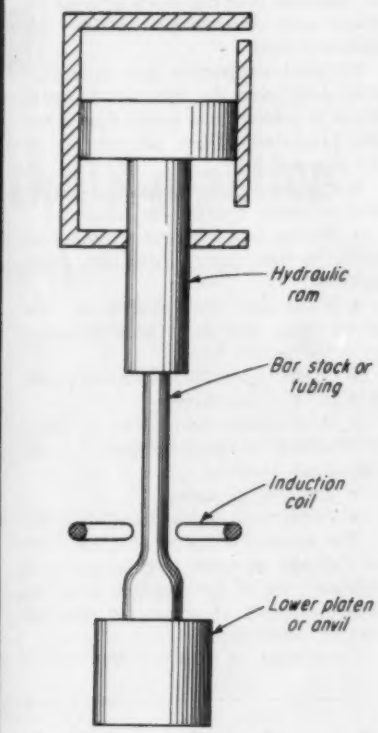


Above is a standard Springfield 2A-TR vertical universal grinder. It swings 25"; the grinding head has a 21" stroke and it grinds holes to a nominal depth of 18". The head can be tilted 45° in either direction. Electro-hydraulic control is standard with pendant pushbuttons. The Model 2A-TR costs less than most horizontal chucking grinders of comparable size; it can do the same work plus a wide variety of jobs that just can't be done on a horizontal. Gravity works for you in vertical grinding.



Control rod is made easier . . .
when hot metal is gathered at each end for internal threads. Tube is 8630 steel, and has uniform wall thickness. Similar rod shown in three drawing-and-swaging stages at right would start with wall three times as thick



Metal gathering builds up thin round parts

Heat and pressure form tube ends to displace lengthwise stock into heavy buildups that can be machined as flanges and threaded necks. This results in integral end structure that provides strength and rigidity on parts built from thin, light metals. It's an addition to the drawing-swaging category

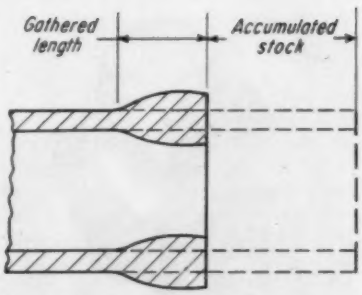
By Alfred H Peterson, group engineer, Lockheed Aircraft Corp, Burbank, Calif

Lightweight arms and links with heavy integral ends can be produced complete from thin-wall tubing or rod by "metal gathering," a process adopted recently for aircraft parts. The name is an old term applied to preliminary forging operations where the metal is moved into an area to be thickened; but the application here is new.

Metal gathering produces flanges, bearing seats, and other special end configurations that can be machined. The process eliminates adding end fittings by welding, bolting, or riveting, and it does a better job than more conventional drawing and swaging, where stock with much heavier walls must be formed down to final shape.

The method permits building up material without waste on the outside, inside, or both sides of the original stock. Uniform wall thickness can be held down much closer to the end section to eliminate long drawn tapers, if desirable.

The work is done in a press equipped with induction - heating equipment and with simple tooling. The heater brings a section of the stock to forging temperature as end pressure from the hydraulic ram forces metal in to a die that controls the shape of the gathered end. Only material to be gathered is heat-



Local heat from induction coil . . .
brings stock up to forging temperature as pressure is applied to upset end. This forces in additional stock, which is controlled by confining punch and die

Metal gathering . . .

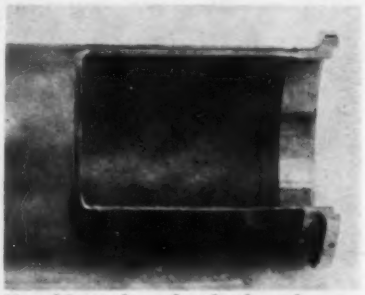
ed, and the original stock retains its shape and dimensions outside the gathered area.

Physical properties are considerably improved in the upset area; grain is refined and metal flow lines are produced. Other advantages of the process are:

- Parts are all one piece, end to end, without brazing or fastening
- Heavy end sections are integral with the stock from which they were formed
- Machining is reduced at the work ends, and may be eliminated in some cases
- Grain flow increases strength and fatigue resistance
- Heat-treatment may be uniform throughout the part because it is all the same material
- Material is saved
- Production is rapid and uniform

The amount of material in the tube or rod can be calculated, along with calculations of die volume, and the exact amount of stock for the job can be determined.

Compared to drawing and swaging, the process is much simpler. No forming mandrel is required, and no annealing is required because the process requires only one shot. Where a part with an integral end buildup formerly had to be drawn from heavy-wall stock over a formed mandrel, then drawn out and swaged at the end to rebuild the end thickness, the part can now be produced with a single press operation out of stock that already has the required wall thickness. Specific heat, pressure, and tooling are decided according to demands of the material being formed.



Metal is gathered at both ends . . . of this tube to provide stock for machining external flanges and internal bearing seats. Wall thickness remains the same

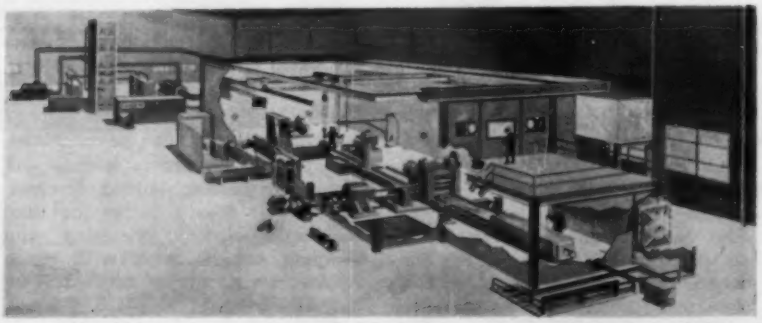
Completely sealed plant-within-a-plant will fabricate exotic metals for space craft

Space pilot? Man from Mars? The figure at left is neither. It's what the well-dressed technician will wear to shield him from infra-red and ultra-violet radiation when Universal-Cyclops Steel Corp completes its exotic metals fabrication plant at Bridgeville, Pa, next year.

The plant itself will be a full-sized one sealed within a building filled with argon gas. Containing a rolling mill, crane and impactor, the plant will fabricate exotic metals for use in missile cones, rocket engines and space vehicle shells. After metals are processed, they will be coated to prevent oxidation when exposed to outside air on leaving the plant.

Technicians' "space suits" like the one shown at left will have conditioned air piped in, and carbon dioxide piped out of the sealed area to prevent contamination of the 99.995% pure argon atmosphere. Argon prevents contamination of such metals as molybdenum, columbium, tantalum and tungsten by air.

The plant will produce refractory and reactive metals in bars, forgings and sheet—all capable of withstanding temperatures to somewhere in the neighborhood of 2000 F.



RUSSIAN CERAMICS:

Unusual geometry contrasts with US practice

By Robert T Hook,
chief metallurgist,
The Warner & Swasey Co,
Cleveland

Soviet ceramic tools cut with positive angles, large side cutting-edge angles, and with copper foil clamped under the bits to reduce vibration. This contasts sharply with American custom, where angles are usually 5° negative and side cutting-edge angles are much sharper.

Because of recent reports of great Russian success with ceramics, including speeds as high as 10,000-12,000 sfpm, Warner & Swasey attempted to test both ceramic materials and tool geometry. But Thermocorundum and Microlite ceramics were not available here in sufficient quantities for test, although fairly complete data on Soviet tool geometry was available from R C Brewer of City & Guild's College, London (see table).

Tests were therefore made with US ceramic bits held in special toolholders built to reproduce the Russian angles. In the original data, only the rake angle was given. This was measured from a vertical plane parallel to the side cutting-edge angle. However, this resulted in side and back rakes as noted. The only missing item in the table is the width of the land on the rake-face flat.

The tests were aimed:

- To use Russian geometry exactly as specified
- To test this at 900-1000 sfpm and determine tool life and inches of metal removed
- To modify the Russian-angled holder and cutting tip according to the latest techniques available here to determine what improvement is possible.
- To compare results with current US standards of ceramic peformance

No chipbreaker information was available, so a standard Adamas breaker was added.

Results were not good—at 900-1000 sfpm only 5% of the metal removal currently the standard here (450-500 cu in.) was possible. But after a land angle was honed on the side cutting edge, performance was improved 12 times, though this was still 75% below American standards.

However, at speeds of 1575-1650 sfpm, the Russian angles performed slightly better than US geometry—270.6 cu in. compared to 250 cu in.

Included with the data from Mr Brewer was a note that he had translated a Russian pamphlet in which a worker was quoted as having solved his vibration problem with ceramics by clamping the bit through a thin copper foil.

TOOL GEOMETRY OF RUSSIAN CERAMIC TIPS

Material Cut	Rake Angle	Rake Face Flat	Relief Angle	SCEA	ECEA	Nose Radius (In.)	Depth of cut (In.)	Feed (In/r)	Cutting speed fpm
Steel	5°	0	9°	45°	15°	0.06	0.04	4-20	@400 - 900
Steel	5		9	45	15	0.06	0.04	10	* 400 - 900
Steel	5		9	45	15	0.06	0.03	20-30	* 400 - 900
Cast Iron	5	-5°	8	60	15	0.01	0.12	2-8	+200 - 300
Cast Iron	5-15	-5	5-20	30-60	15-25	0.01	0.12	7	+300
Steel ‡	0-5	-5	10	30-45	10-15	0.07			
Steel ‡	-5		15	20-30	10-15	0.06	0.04-0.12	12-24	900-1500
Copper	10		12	30		0.05			
Alloy	10	-4	8-10	45	10	0.05			

LEGEND

@ For finishing cuts giving 20-100 microinches. 60-65 tons/sq. inch.
* For finishing cuts.
+ 3.37% C., 0.6% Mn., 2.2% Si., 0.17% P., 0.11% Cr., 0.11% S., 0.12% Ni., 375-400 Bhn.
‡ Carbon steels and tempered alloy steels. Limit feed to 4 thou/rev for finishing.
‡ Hardened carbon steels. Limit feed to 4-10 thou/rev.

Results of Cutting Tests—Russian vs US Tool Angles

Test No.	SECA	ECEA	Rake	Nose Rad.	Land honed from vert. plane	Depth of cut	Feed	Speed range SFM	Cu. in. removed	Tool life in actual min.	Remarks
1	45°	15°	+ 5° From SECA	0.060	0° X 0.000	0.020	0.020	400-900	77.8	6.1	Russian Holder
2A	45°	15°	+ 5° From SECA	0.060	0° X 0.000	0.125	0.011	950-1000	12.0	0.69	Russian
2B	15°	15°	Negative 7° + 7°	0.060	60° X 0.030	0.125	0.011	950-1000	494.2	29.6	American-Normal Land Angle
2C	45°	15°	+ 5° From SECA	0.060	60° X 0.030	0.125	0.011	950-1000	141.4	9.3	Russian Holder With American Land Angles
3A	45°	15°	+ 5° From SECA	0.115	60° X 0.030	0.0625	0.011	1575-1650	270.6	23.8	Russian Holder With American Land Angles
3B	15°	15°	Negative 7° + 7°	0.115	60° X 0.030	0.0625	0.011	1575-1650	250.0	18.4	American-Normal Land Angle

Plastic molders chalk up record year

"We have sold more plastic molding machines so far in 1958 than during any previous year in our history," a press builder reported to *American Machinist* during the 8th National Plastics Exposition in Chicago last month. This isn't just an isolated instance—almost every other exhibiting builder reported the same thing. Not only has business been good during a year of recession—it has been gaining momentum fast in the last two months.

Today more than 9000 injection molding machines are installed in U S plants, along with 15,000 compression molding presses, and more than 1500 plastic extrusion machines.

Evidence of the industry's boom was the record amount of floor space given over to displays of 209 individual companies—100,000 sq ft.

Thousands of New Products

Machinery makers exhibited more than 100 new or improved machines and tools for processing plastics. Raw materials producers showed something like 35 new plastic formulations or combinations with other materials. And more than 1500 new or improved consumer and industrial products and applications—ranging from household items to missile and rocket parts—were on display.

"Valve-Gating" Debuts

Outstanding among new developments at the Show was Columbus Plastic Products Inc's "valve gating," a pre-compression molding method, said to be capable of cutting plastic injection molding costs as much as 25% in the manufacture of a wide variety of consumer and industrial products.

The new valve gating technique, developed and patented by Columbus Plastic Products Inc, Columbus, Ohio, involves pre-compressing molten, high-density polyethylene plastic in a chamber, then releasing it by opening a valve to a series of multiple gates. Sudden release of the compressed material increases the velocity of flow.

Multiple gates (openings into each mold) provide the second major difference between this and conventional molding methods. Gates are positioned at the top, bottom, sides, etc, of the mold—according to its size. Thus the mold is filled more evenly, in a shorter time cycle, and the temperature of the polyethylene in the mold is also more constant.

One effect of this method has been a reduction in rejects. Another benefit is better molded-product appearance. Fine details in the mold are more accurately reproduced because both flow and cooling are better controlled.

Equipment for using this method is supplied by Acme Machine Corp and Hydraulic Press Mfg Co. First public demonstrations of the process were given by both companies in their booths at the Show.

Plastic Molding Revolution?

Since the introduction of the process last January, W R Grace & Co's Polymer Chemicals Division has arranged for 37 licenses to employ the development. During the last 11 months, this company has acquired sufficient experience with the new technique to claim that it may revolutionize plastic molding.

Of particular interest to missile parts producers was a new thermosetting polyester plastic (Vibrin 136A) developed by U S Rubber's Naugatuck Chemical Division in conjunction with Boeing. The new plastic has approximately twice the heat resistance of any polyester plastic resin available up to now. It will withstand a sustained temperature of 500 F and a peak load of 1000 F, and is already being used as a radome and nose cone material in Air Force jet bombers and tankers. Radar transparency of the new material is claimed to be 10 times better than that of any other polyester.

A new process, announced and demonstrated at the Show by Union Carbide Plastics Co, Division of Union Carbide Corp, makes it possible to mold rigid polyvinyl chloride without thermal decomposition. Process, it is claimed, achieves better weld strengths, thinner sections, improved gloss, uniform surface appearance, and working of more complex shapes.

Curing Time Cut

Curing time can be reduced as much as 15 to 20% for many materials and parts with a new infra-red preheating attachment, manufactured by F J Stokes Co and shown on that company's Model 741 fully automatic compression molding press. Device heats the molding powder while it is being agitated in the feed hopper. Also introduced by Stokes: a 6-oz-capacity fully automatic injection molding machine.

Another 6-oz-capacity automatic molder, introduced at the Show by Package Machinery Co's Reed-Prentice Division, has electronic timers that cut the operating cycle to only 1.7 sec. The new machine is said to be a successful combination of injection, extrusion, impact and compression molding.

Baker Bros Inc showed a self-contained molding press equipped with a new automatic transfer cylinder which permits switching either to automatic compression or transfer molding in a short time.

Largest molding machine to be shown was an improved Model 800 injection molder built by National Automatic Tool Co. Up to 80 oz of general-purpose polystyrene material can be injected per cycle.

Sees world machine tool symbols soon

U S machine tool builders have joined with European builders in an effort to establish a set of machine tool symbols that would be easily recognizable by users of all nations. But U S symbols don't always agree with those proposed by the International Organization for Standardization, C T Blake, director of engineering, Warner & Swasey Co, told American Standards Association's Ninth National Conference on Standards last month in New York.

But Mr Blake feels that if American suggestions (and there are relatively few of them in comparison with ISO's 80 proposed symbols) are accepted, an international recommendation will be approved in the near future. A combination of U S and European symbols, he feels, stands a much better chance of acceptance by American builders and users than one based solely upon the old ISO-proposed standards.

Something new in anchor bolt design — a floating nut in a box

Late last year, H K Lee of Detroit published a controversial article (*AM*—Dec 2 '57 p105) in which he took machine tool builders to task for failing to come up with something better than the traditional hooked-and-threaded rod.

Solves Own Problem

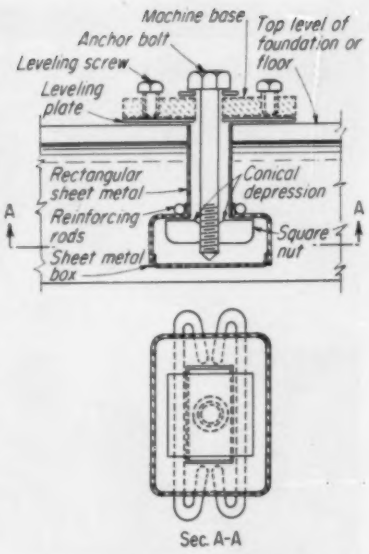
Now, Mr Lee has come up with his own solution to the problem, the patented design shown at right—based on the idea of a floating nut inside a metal box which has a width less than the diagonal dimension of the square nut. The box is fastened to reinforcing rods or structural members to hold it in position while concrete is poured

Before the machine is moved into position, the square nut is inserted through the floor-level opening. When the machine is spotted, a pointed anchor bolt is dropped through each hole in the machine base and into the conical depression on the nut. The nut is free to move a certain amount in any direction to compensate for errors in alignment, but it cannot rotate.

Claims Five Advantages

Lee claims five major advantages for his design: 1) it is easy to install and hold in a fixed location; 2) it does not project above the floor surface; 3) it permits a smooth, flush floor that does not require grouting; 4) it provides adequate structural strength; and 5) it is easy to adjust in all directions.

"The machine industry," he says, "in order to improve machine installation and performance, should participate in providing a better anchor-bolt design. With this in mind, I am presenting the Flush-top and Adjustrite anchor bolt as a suggestion for further evaluation and further comment."



Air Force Ballistic Missile Program under fire

The venerable political squabble over whether the administration must release to Congress documents prepared solely for administration use has flared up once more.

At issue is a recent Air Force Inspector General's report which tears into the way the Air Force is managing the Ballistic Missile Program. The General Accounting Office, an arm of Congress which is making an investigation of its own into the program, wants a copy of the report. So does the House Government Operations Subcommittee, which makes a speciality of probing such issues.

"Long-Smoldering" Hassle

In the wake of the new controversy has come the public disclosure of a long-smoldering resentment against Air Force missile development and procurement policies:

- The role of Ramo-Wooldridge as system engineering contractor for Air Force ballistic missiles has come in for serious questioning.
- The purchasing operations of major Air Force missile contractors has come in for severe criticism.
- Air Force procedures in handling requests for government-owned production facilities are characterized as "not in consonance with the (Ballistic Missile Program's) priority" and not "justifiable in terms of costs." The Air Force is also criticized for failing to provide contractors with "guidance" in commercial leasing of equipment.

These details are aired in a 35-page summary of the Inspector General's report, reluctantly submitted to the committee by the Air Force. With White House backing, the Air Force has refused to release the full report.

Ramo-Wooldridge Criticized

Also disclosed in the report are critical comments on R-W by major but unnamed ballistic missile contractors. The criticism boils down to resentment that R-W was placed in a "favored position to compete with older established companies."

Quoting the contractors, the Inspector General's report alleges that R-W's "involvement interfered with contractor performance." There are also quoted complaints that R-W personnel are not "well qualified to give technical direction" to primes.

Aside from the extensive references to Ramo-Wooldridge, the report criticizes the purchasing operations of major contractors, claims that many companies have failed to give the purchasing function "sufficient status."

Companies singled out for "deficiencies in purchasing" are Martin, prime contractor on the Titan ICBM; Convair, the prime on the Atlas ICBM; and Aerojet-General, rocket engine producers.

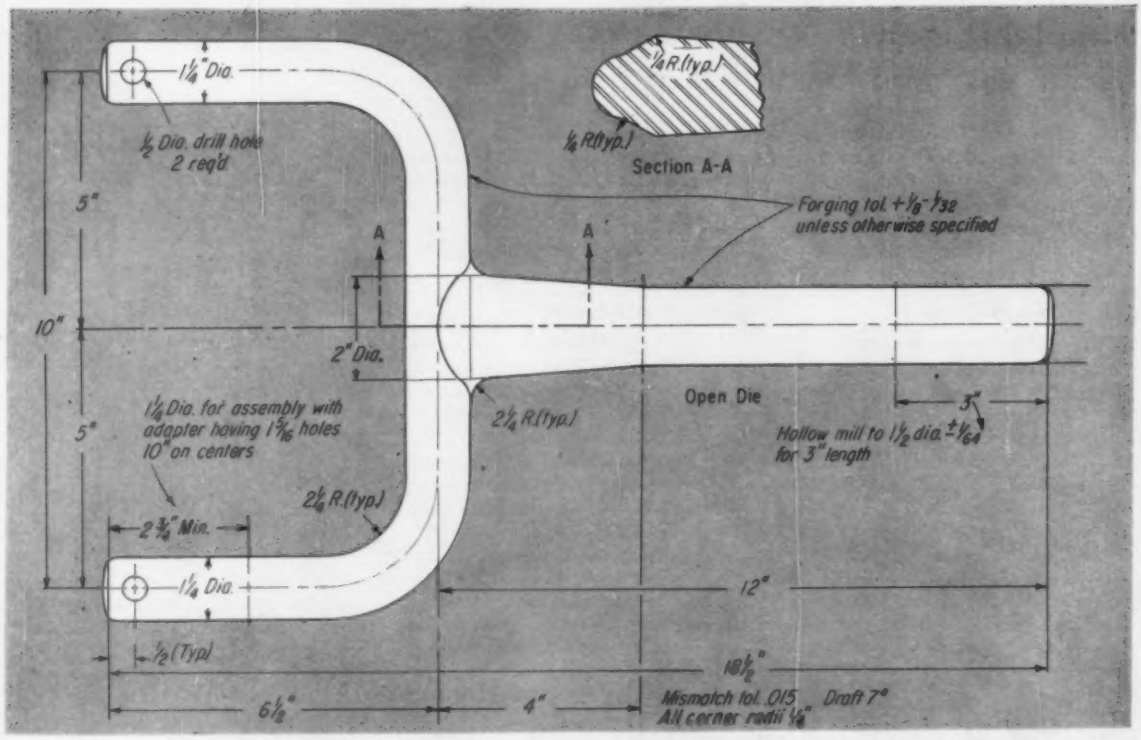
Subcontractors "delinquent"?

As a result of downgrading the purchasing function, the report says, there have been faulty procurement practices. In some cases, the contractors' engineering departments have subcontracted work directly with little coordination with their own purchasing departments. Subcontractors later became "delinquent" in performing the work, the report claims, because of the primes' failure to "follow up and control."

Forced to Pay High

In other cases, the report says, primes have been forced into "premium costs" for material by manufacturing in their own plants instead of allowing their purchasing departments to try to buy on the outside at lower prices.

There's also criticism that prime missile contractors have repeatedly violated military procurement regulations by awarding cost-plus-fixed-fee subcontracts without prior Air Force approval.



Drop forgings can be used for

"Drop forgings? They're okay for some things but not for short runs. Dies cost so much you can't get your money back except on long runs."

This theory, fairly widely held among shop men and engineers, especially those whose experience with drop forgings is limited, is at best a half truth.

Experienced producers of drop forgings are giving the lie to the long-runs-only belief almost daily. Modern techniques can offset the cost of dies.

For instance, much of the drop-forging process can often be done with stock dies or hammers, and this not only saves on die costs but on total cost of producing the forgings themselves.

Too, a properly made forging frequently effects savings in machining and weight (or both) of a finished part. Certain special dies will cut setup costs drastically on short runs. Take, for instance, these case histories from Merrill Bros' drop-forging shop.

Drawing above shows a die for producing limited quantities of gate valve forks. Ordinarily, a fork such as this is difficult to make by drop forging because the tynes are spread far apart. Cost of making the fork from start to finish in a drop-forging die would have been prohibitive for such a short run. Merrill Brothers solved the problem by performing two initial operations in a Bradley hammer, using stock flat dies.

Progressive steps in preparing the blank (as shown on opposite page) started with a round bar of AISI C-1025 steel 2¾ in. in dia and 12¼ in. long. In the first forging operation the tyne end was flattened and the shank rough-swedged round.

Then the shank was lengthened and brought close to size in the same heat by the Bradley hammer. This left a heavy, somewhat flattened center portion, which provided metal for joining the tynes to the shank.

Then a hole was drilled through the center section, and a saw cut made to separate that portion which would eventually become the tynes.

Step B shows the tynes after they have been spread by a bulldozer, and Step C, the same tynes after they have been bent to shape in the same machine.

This completed the blank, which was then put into the drop-forging die (Step D) to produce the untrimmed forging in Step E. Finally, the forging was trimmed hot in the die shown in Step F.

This method involved several operations, all of them quite simple, but it kept die cost low, partly because both halves of the drop-forging die were produced by a Pratt & Whitney oscillating die sinker.

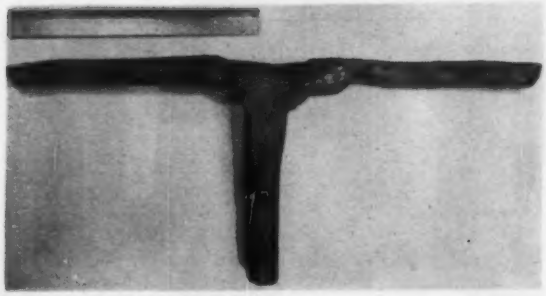
Trim die cost was held down by electrical-discharge-machining the hand-welded metal to the exact contour of electrodes poured from the forging die. This was done after flame-cutting the recess close to size and depositing hard metal by hand-welding with Stellite rod, thus producing cutting edges suitable for hot trimming. In this case, the punch was made from the piece burned out in producing the female half.

The punch was shaped to fit the forging by electrical-discharge-machining with electrodes poured from the forging die. Punch and knockout contour did not have to fit the female die recess closely.

More-expensive dies would be needed for long pro-

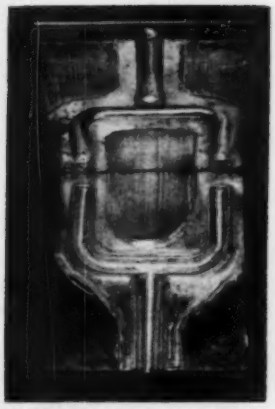
UNUSUAL METHODS KEEP DIE COSTS DOWN
. . . in production of large drop-forged yokes for gate valves, as shown in drawing at left, and in successive production steps on this page.

STEP A: (1) billet, (2) first forging, (3) second forging, (4) drilling and slotting



STEP B: bending to spread forks

STEP C: bending to fit yoke into die



STEP D: drop forging die

STEP E (left): untrimmed drop forging

STEP F (below): trim die in press

short runs

By E Merrill Gardner, president
Merrill Brothers, Maspeth, N Y

duction runs of the fork, but their cost would be offset by savings in time. Such dies were ruled out in this instance, however, because the run was short. But the upshot of this method was that the customer obtained all the advantages of closed-die drop forging without a large investment in dies.

Production of the female "Tubelox" socket shown in Fig. 1 involved a totally different method, because these forgings were required in large volume, and had highly irregular internal surfaces. This unusual internal shape meant that the forging had to be produced in open form. The forging was subsequently closed to make approximately circular external sections.

Merrill Brothers worked out a method of producing this forging for a customer who didn't think a one-piece forging would be practical for a socket that had to be inserted into one end of a length of pipe. Pipes such as this are used in making demountable steel scaffolds for building construction and repair. They are assembled for a specific job, then dismantled and set up again and again in various ways to suit a wide variety of construction and repair jobs.

Thus it was essential that the socket fit the male T-shaped end of a mating, conventional forging fastened to the end of a mating pipe section. When Tee projections were inserted, wings of the Tee slid to the bottom of two longitudinal slots on opposite sides of the socket, thus locking the Tee bayonet fashion firmly in

FIG. 1: forged Tubelox socket as it appears before (top left) and after (top right) cold bending of the two halves to form a sleeve with external dimples and internal slots (bottom, left and right)

the socket. Ends of the pipes were held together firmly in this way, and when it came to dismantling, a reverse turn unlocked the Tee so that it could be pulled out easily.

Because of this, it was important that the female locking surfaces be formed in proper relation to each other in a one-piece forging. This was readily accomplished with the piece open—by trimming the forging and then bending it cold to form a sleeve.

Bend was made easily at a thin section along a line in the wall parallel to the axis. OD was then sized by cold forming to make a drive fit in the tube. In making the open forging, eight dimples were produced on outer cylindrical portions. These came up against the inner wall of the tube when the socket was driven into it. After insertion, the tube wall was dimpled into the depressions, anchoring the forging permanently in the tube.

Although the dies for producing an open forging for this job were complex in shape, they could be produced easily for long runs by electronic erosion.

Then the two halves of the forging were readily made in one piece from round bar.

Forging in such a die produced recesses and projections in correct locations. Coining of the OD to size was easy after the two sections were brought together in an equally simple cold-forming operation. No machining was required, and strength of the light forgings was greater than that of the tubes.

Some parts, it was found, could readily be produced in special dies for drophammers (see Fig. 2). These dies were made in two halves, with the parting faces vertical. The outer-side faces, however, were inclined 30° to the parting plane to produce an included angle of 60°. These faces fit into a V-block which was locked on the hammer bolster. When in the Vee, the die was closed and ready for forging.

Attached to each side of the die was half of a tong that was closed when the die was set into the Vee. After the forging was made, tongs slid the die out of the Vee and opened the two halves, releasing the completed forging and leaving the die ready for the next hot preformed forging to be inserted.

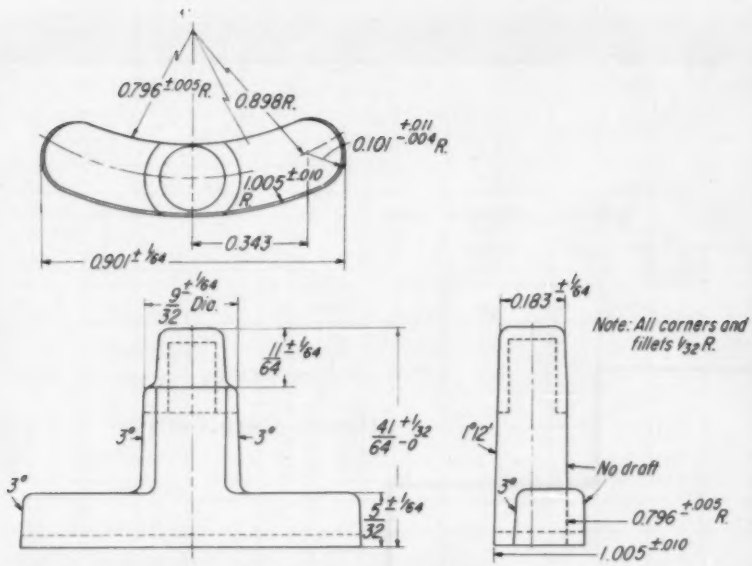
In such a die (one with vertical parting such as upsetter dies have) forgings can be made without draft. But setup time of three hours or more would be needed with an upsetter die, whereas none was required in this instance—although the services of a helper were required to feed hot preformed forgings into the die.

One forging made in dies of this type has a 15/16-in. cylindrical stem and a 3⅜-in. circular flange that is 13/16 in. thick over most of its area. Inner face, however, has a recess 13/32 in. deep.

Upsetting for this job was done in the top recess of the die, employing a flat hammer die in a board drophammer. No draft was required, but flange thickness varied somewhat if the billets were not all of precisely the same size. Some flash was produced at the outer face of the flange. And because all die faces were held together by a wedging action, a line, rather than a flash, was produced at the die parting.

An eye pad with a flat flange was produced by this same type of die without draft, but here another conventional hammer die was needed to forge the eye and partially form the flange. This part then had a 10° draft at each side. When the initial forging was so produced, the eye trimmed and the center hole pierced,

FIG. 2: Split die (left) has a lower recess that fits a preformed blank. Center: die is pushed into V-block by tongs. Hot preform is then placed in die (right), where it is struck by the flat hammer die that forms a recessed flange



Here is how a small aluminum forging is held to unusually close dimensions . . .

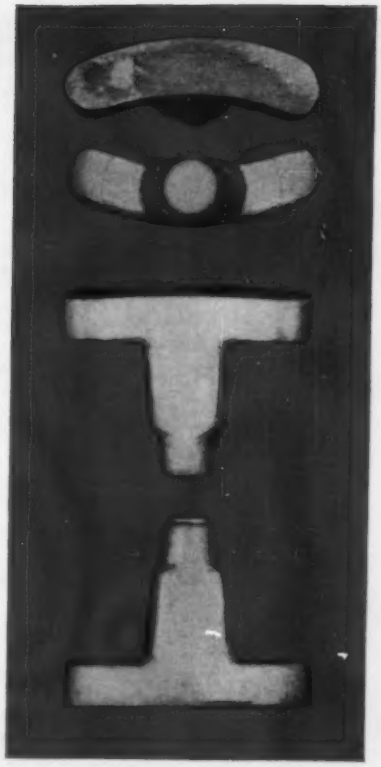


FIG. 3: drawing above shows a small aluminum forging produced at Merrill Brothers with no draft on some faces, only slight draft on opposite faces—and to unusually close tolerances. Right: the same aluminum forging as it appears without any machining except removal of flash at the flange contour. Flat face upper die makes the flange flat.

the forging was reheated and set in the split die, where the eye rested in recesses separated by the die parting, held in place by projections that fit the eye hole. The rest of the forging rested in an upper, open recess shaped to form the flange.

A flat-end hammer on a board-drop machine struck upsetting blows, causing the metal to expand and fill the recess and leaving the flange flat. There was no draft, but some flash left at the flange contour had to be trimmed off.

Clearly, dies of this type have a wide range of uses, and they can be quickly put to work with a minimum of setup time. In fact, short runs sometimes can be completed with these dies in the time required to get an upsetter die ready for use. But for long runs, the upsetter may be better if time per forging is shorter.

Most hammer die forgings require draft. Otherwise, the forging would stick in the die. But there are times when draft can be actually or nearly zero, provided a knockout can be used.

In such cases, the knockout pin projects through the die, usually resting on a lever, the outer end of which is struck by a hand hammer while the die is open and the drophammer is at rest.

Knockouts have their limitations, but in many instances they can eliminate or reduce machining.

In making the small aluminum forging shown in Fig. 3, draft and close dimensional limits as forged were the most important considerations. Here, the trial order required only a few pieces, so the cost per piece was not expected to be low. Normally, a piece of this shape would be forged lying on its side in an open die. The usual allowances would be made for draft on ends, die-closure variations and mismatch.

But because of the close as-forged and draft limits involved (ranging from 0 to a maximum of 3° in the longitudinal plane), forging had to be done with the work on end, parallel to the longitudinal axis. This made it necessary to use a die with an arc-shaped flange at the top, and with its top face in contact with a flat upper die. Because the whole cavity was in the lower die, matching problems could be avoided, and the forging could be as closely sized as the cavity.

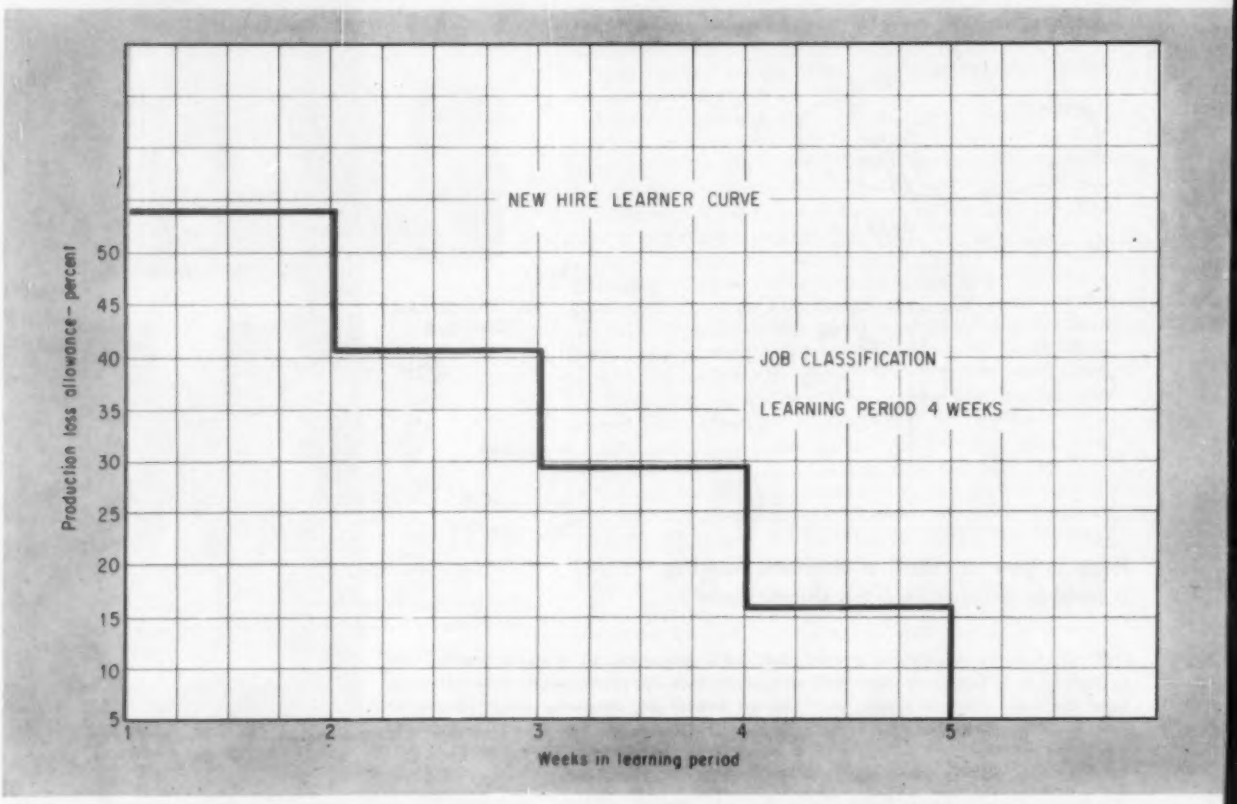
Special forging blanks had to be machined for the trial order, because an unformed blank cut from flat stock could not enter the cavity.

No. 14S aluminum alloy was specified, and blanks were heated to about 780 F (approximate optimum temperature for forging 14S aluminum). After trimming, the forgings were heat-treated to T-6 specifications. In producing this piece in quantity, however, blanks were prepared by forging them on their side, conventionally, then trimming them before forging in a die that brought the forgings to specified size.

Forging was done in a press, leaving only a thin flash at the outer edge of the flange, where it could easily be trimmed. At the bottom of the die recess was a knockout pin with its inner end resting on a circular boss.

Although there was no draft on the forging's concave side, and only 1 deg, 12 min draft on the opposite face, the forging was easily pressed out of the die recess by an ejector pin.

Admittedly, a forging of this type is unusual, but it illustrates what can be done in the way of precision forging when the customer imposes hard-to-meet conditions, but is willing to pay extra die costs to avoid the greater cost of machining to extra-close tolerances. In reproducing the die, electronic erosion insures that its accuracy will be maintained.



Step curve averages allowances on a weekly basis. A smooth curve can be followed, but accounts must be readjusted each working day to show a gradually decreasing allowance. If learner improves steadily, earnings will average normal rates

Learner curves boost

You can rate new or transferred workers against tailored production curves to check their progress and still allow full pay for experienced hands. Here is how learner curves work, and how they are developed for each specific job

A painless method of getting a man through on-the-job training where he must work as a member of a crew should include these points:

- Regular crew workers must enjoy their normal earnings
- No slackoff must be allowed in the working pace
- Production losses must be minimized
- Unit-cost increases must be controlled

Learner curves help provide these advantages.

One of the most important functions of learner curves is to allow comparing a new man's progress against an established standard to see how he improves. If his performance is poor, he may be a misfit and should be transferred before he becomes a permanent employee in that job. This effect helps to minimize production losses and to keep unit costs down.

A second important function is to provide a reasonable basis for subsidizing regular trained workers during the break-in period. At the same time the allowances must not be so generous that the whole crew can just quit working.

Both of these functions are served by establishing a ratio or percentage, which represents the amount the new man will hold back the group until he is trained. His retarding effect must diminish as he stays on the job, until finally he can be rated the same as an experienced worker. These adjusted ratings can be applied to the pay scales of trained workers during the break-in period so they will receive at least normal compensation.

Building the curve

Cooperation between industrial engineer and line supervisor is necessary to establish the total percentage allowance for the job. This allowance is a percent loss of production over the complete learning period —four weeks, or whatever the case may be for a specific job. The total allowance is then broken down into proportional steps for successive weeks of the training period, according to the formula:

$$F = \frac{A}{1 + 2 + 3 \ldots . + N} \quad (N - X + 1)$$

Where F is the percentage allowance for a given week, A is the total allowance, N is the number of periods (usually weeks) over which the training time is spread, and X is the given week for which you are figuring an allowance.

Thus, supposing an allowance of

Learner record sheet Department Mold

Job title Servicer Group 1 Leader / 1 Helper / 2 Servicers

Shift 2nd Learing period 4 Wks.

Clock number	Name	Date on job	Crew size	Incentive hours worked	% Efficiency earned with allowances	Learning curve allowance	% Efficiency crew normally earns	Remarks	Super initial
467	John Elliot								
	First day	8-1958	4	32	124	10%	132	None	L.J.b
	Second day	8 2058	4	32	130	7%	132	None	L.J.b
	Third day	8 2058	4	32	126	4%	132	Learner slow	L.J.b
	Fourth day	8 2258	4	32	127	1%	132	None	L.J.b
	Fifth day								
	First week								
	Sixth day								
	Seventh day								
	Eighth day								
	Ninth day								
	Tenth day								
	Second week								
	Eleventh day								
	Twelveth day								

Typical learner record shows results with a four-day learning period. Worker here was only allowed a total of 22% because of previous experience. Note that third day was low, but by last day (with lower allowance) the learner was picking up speed

team output

By L A Barron, chief engineer,
John A Patton Management Engineers, Inc, Chicago

120% is selected for a specific job, the first week will receive an allowance of:

$$F + \frac{120\ (4 - 1 + 1)}{1 + 2 + 3 + 4} = 48\%$$

and allowances for the second, third, and fourth weeks will be 36%, 24%, and 12%. These percentages can be plotted on a graph and applied by the payroll department.

Dependent learners

When group production depends on the learner, allowance is made for the whole group. Experienced crew members are subsidized according to the learner curve:

First day's production = 264 units

264 units × 6.00 hr/100 units (standard rate) = 15.8 group earned hr

15.8/3 workers = 5.3 earned hr/employee

Subsidy: 9.0 possible hr × 48% = 4.3 hr

Total earned hr = 5.3 + 4.3 = 9.6 hr

Earnings = 9.6 hr × $1.545 = $14.83

Learner's earnings = 7.5 actual hr × hire rate

But if the earned hours per worker exceeds the actual number of working hours, the learner earns his hiring rate × earned hours

Transferred employees must be treated more carefully than newly hired workers. These steps are necessary:

- Evaluate his qualifications
- Start him at a valid point on the learning curve
- Notify the employee, his group, and his union committee, if necessary, of his starting percentage

Thus, when an employee is acquainted with the job because he has substituted in that spot at times, he might justifiably be started off at 75% of the usual allowance—or some other percentage. In this case, he picks up the allowance for that point on the learner curve and follows the learner curve on out until his particular learning period is finished.

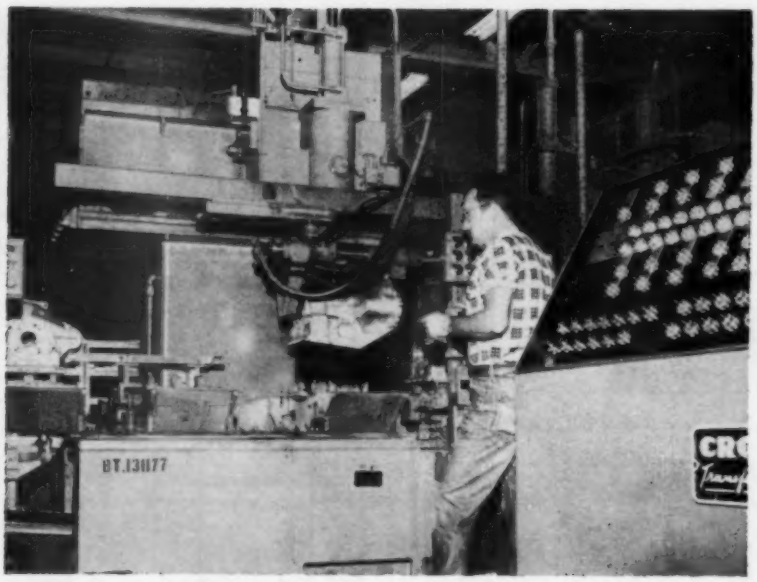
If the worker has been away from the job, but was familiar with it at one time, allow 5% on the curve for each month he has been off the job.

Keeping the curves accurate

Learner curves must be periodically reviewed by Management, the same as other incentive standards. Changes in job content and in equipment must be carefully judged, and such changes reflected in the curve when warranted.

Earnings must also be reviewed to determine the effect of the subsidy allowed. Most often the reason for inequitable earnings is improper analysis of employee qualifications and experience. Accurate records should be kept and posted for line foremen. These should include date the job started, crew size, incentive hours worked, hours and efficiency earned without allowance, subsidy, and hours and efficiency normally earned.

1 . . . Manual loading
. . . starts transmission cases through 25-station Cincinnati transfer machine. Aluminum castings are milled, drilled, finish-milled, bored, counterbored, faced and chamfered



2 . . . 26-Station transfer machine
. . . made by Cross drills, reams, chamfers, counterbores, spotfaces and taps holes in several different types of transmission cases. Machine is designed to lock out stations electrically that are not required for any particular part. Here, an automatic positioner turns the part 90° in the horizontal plane to produce side holes after end holes are finished

FORD SHARONVILLE: Proving ground

They're trying out some utterly new ideas in automation—static controls* teamed up with "building block" machine tools—at Ford's brand new Transmission and Chassis Division plant at Sharonville, Ohio. And the expensive innovations are paying for themselves in record time.

Any automated line depends for its success upon reliability and flexibility—and Sharonville has achieved both to a high degree with a combination of building block construction, sectionalized lines, interchangeability of components and, for the first time on a more-than-one-machine basis, static controls.

Result is that Sharonville today supplies 287 different parts for 1959 Ford cars and trucks, all produced automatically. It takes nearly 1000 machines, 145 additional items of major equipment, and nearly seven miles of conveyors to do the job.

* Controls which have an operational life limited only by the materials used in them (usually 20 to 30 years), and which provide switching functions without moving parts. Magnetic device arranges information in a logical sequence ("And," "Or," "Not," "Memory," and "Time Delay.")

With so much equipment involved, operations must be as trouble-free as possible, and interruptions in production held to a minimum. For this reason, Ford chose to install "static" controls rather than conventional ones, even though static controls cost more.

Analysis showed that average overall cost differential to be about 40% higher for static controls because of the extra engineering, designing and installation costs. And because the Sharonville operation is the first, or at least one of the first, applications of static controls on a more-than-one-machine basis, a number of problems had to be solved. Their solution should make subsequent applications cheaper.

The Sharonville lines were supplied fully equipped with static controls by the machine tool builders. First lines to be developed with static controls were those for machining the output shaft, the governor body, and the pump body—all of which are not backed up by duplicate equipment, so that production would be cut off completely in the event of a stoppage in any one.

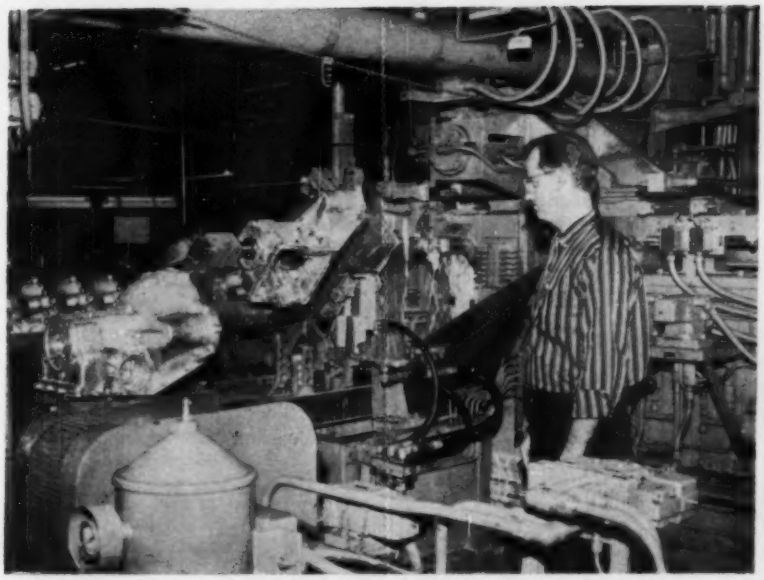
F Joseph Lamb Co built the pump body line, with GE controls. Bilt Rite Tool & Die Co did the output shaft line, and Heald Machine Co developed the governor body line, both with Westinghouse "Cypak" static controls.

Two Heald lines for machining lower valve bodies are equipped with GE controls as are two transmission extension lines by Buhr Machine Tool Co. The most extensive lines in the plant are two for processing transmission cases. One of these is over 600 ft long, the other nearly 500 ft long. Both are equipped with Westinghouse static controls. Each line starts with milling operations in a Cincinnati Milling transfer machine followed—by drilling, reaming, tapping, and similar operations in a Cross installation. Final operations include finish boring in an Ex-Cell-O transfer machine.

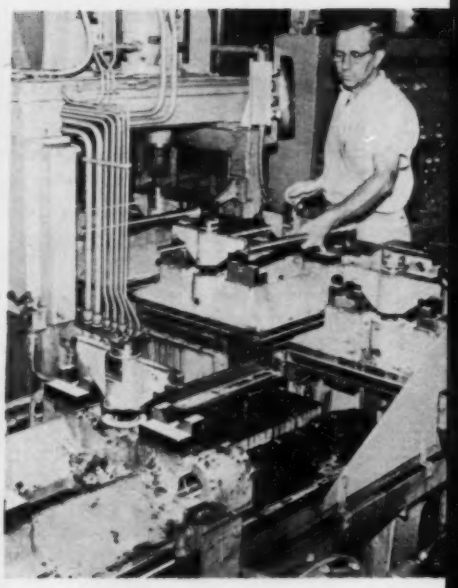
A tenth line was installed with conventional controls only because it was necessary to put it in operation before static controls could be delivered.

In addition to these automated

(continued on page 104)

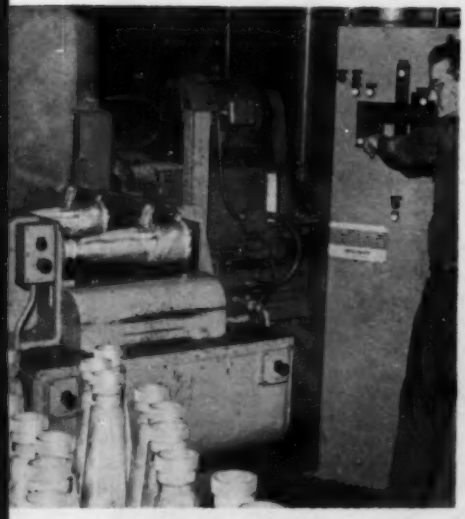


3 . . . Automatic positioner
on this 26-station Ex-Cell-O machine rotates housings on centers, turning them 180° in the vertical plane to put the pan face up. Machine performs such operations as finish milling, boring, facing, automatic gaging, tapping, chamfering and counterboring. Front and rear servos are automatically pressure tested in a Majestic machine in follow-up operation

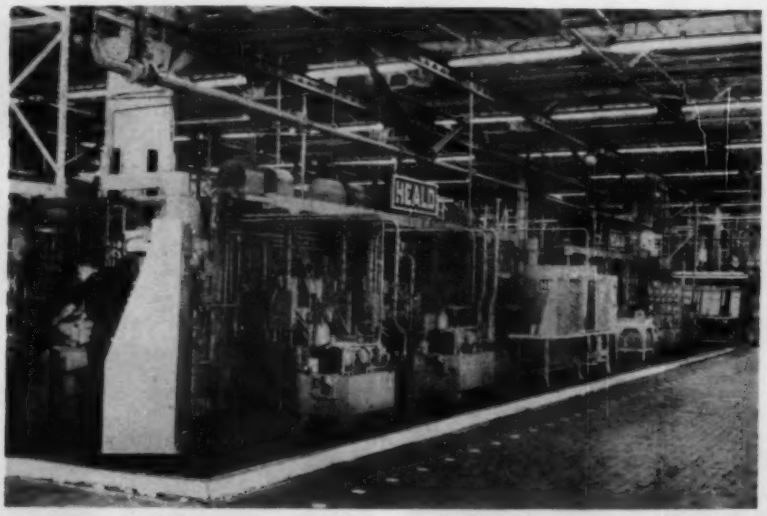


4 . . . Automatic clamping
on 20-station Bilt-Rite machine is done by automatic rotating screwdrivers which screw double-end clamps down against transmission output shaft ends. This line is L-shaped

for new ideas in automation



5 . . . Walking beam
. . . transfer mechanism carries aluminum transmission extensions through a 36-station Buhr machine which turns, drills, reams, chamfers, taps, faces and bores



6 . . . In-line transfer setup
. . . is first in auto industry for machining transmission lower valve bodies, which are usually machined in rotary indexing machines. Two of these lines at Sharonville produce valve bores within ±0.005 in., and to surface finishes of 50 microinches. Facing of five side surfaces is flat within 0.0003 in., and surface finishes are held to 32 microinches. All tapped holes are probed before and after tapping, as are all deep holes and those under ¼ in. dia. Probes are hollow, so that air can be blasted through them to blow out chips as they enter holes. Sensing probes shut down the line if the holes are not drilled to full depth, or if tools break

lines, Westinghouse static controls have been installed on eight automatic Springfield vertical grinders and four automatic Frauenthal grinders. Taking into account the total number of elements used throughout the plant, static controls are split between GE and Westinghouse.

Sectionalized Lines

The flexibility gained with static controls is increased with the sectionalized design of automated lines in this plant. Outstanding are the two Heald lines for machining die cast aluminum lower valve bodies. Each of the two parallel and adjacent lines are made up of two 50-ft-long machine sections. Either section can be operated with the other shut down, both can run simultaneously but independently of the other, or both can operate as a single transfer line. These lines were specifically developed to accommodate future changes in product design because the valve body is the controlling unit in the transmission and is subject to alteration with changes in horsepower or in the power train.

All operations on this particular part are palletized on in-line equipment. Each line performs 112 machining, 52 probing, and seven air-gaging operations. The pallets prevent distortion in aluminum locating surfaces, which would ordinarily be clamped repeatedly in machining 48 separate holes and bores as well as five side faces on this part.

Among the elements included for maximum flexibility and simplified maintenance are spare bases installed for additional heads or slides as needed. The first machine section has two horizontal and one vertical station open while the second has two empty bases. Any unit in either line can be operated independently or locked out to continue automatic operation of the rest of the line.

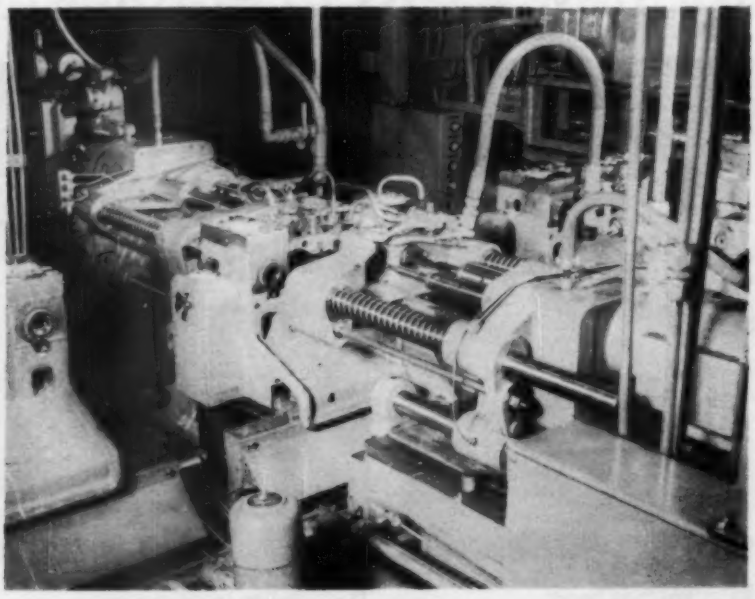
Paired Machining Stations

Machining stations are paired wherever possible. This eliminates idle stations and holds the total length down while maintaining adequate access aisles between pairs of stations for ease of maintenance. All reaming spindles are adjustable radially to permit compensation for dimensional variations in the die cast parts. Finally, all drill units are exactly the same size and capacity and are equipped with 3-hp motors regardless of the number of drills or loading at any given station. This simplifies setup work and reduces the number of replacement parts needed. In the event of an increase in operations at one of the lightly-loaded stations, the added capacity is already available.

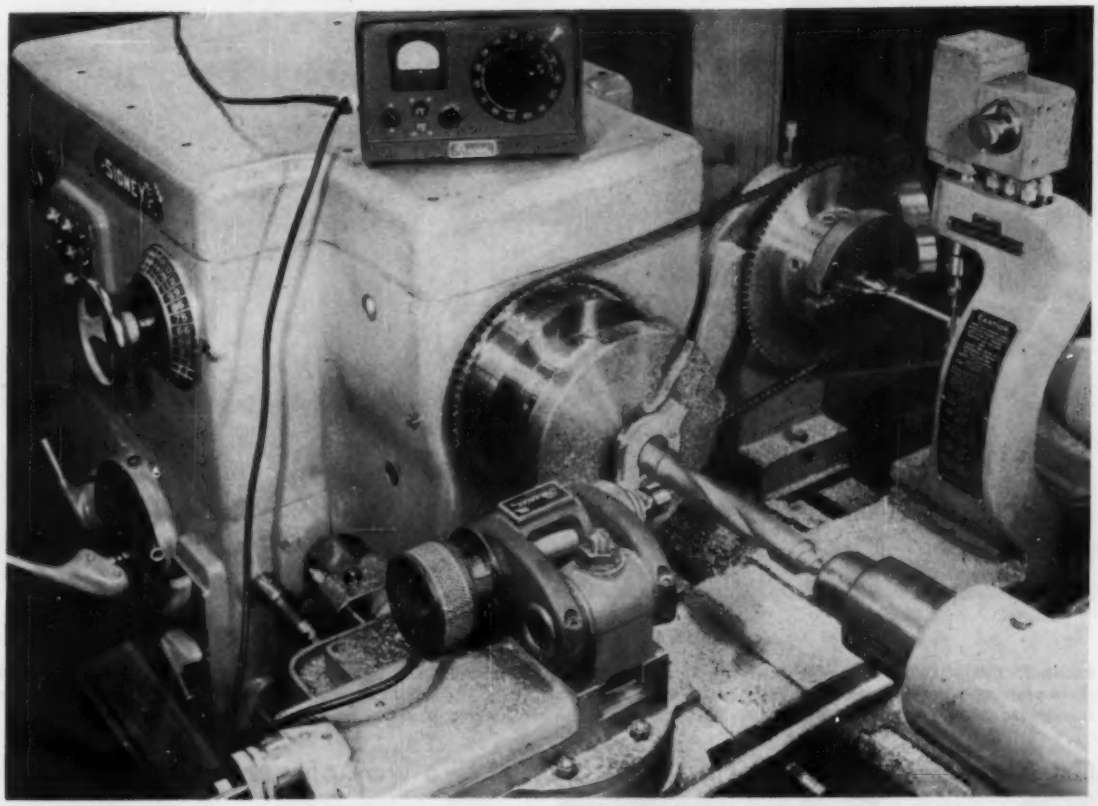
Another palletized line of unusual design is the Bilt-Rite setup for transmission output shafts. The layout here is rectangular—with the pallets carried through machining heads along half the rectangle in an L-shaped line. In this way, the ends of the shafts are machined first as they progress through one leg of the L—then, without turning the pallets, the shafts are machined along their axes as the pallets travel the second leg of the L—at a 90 degree angle to the first. Remainder of the rectangle accommodates an unloading station, a pallet washing facility and a return leg for reloading.

Familiarity, rather than extensive technical training, has been found to be the prime requirement for men responsible for maintaining the static-controlled lines. Long experience with conventional controls, Ford found, is of no real advantage to the electrician who must service the simpler static controls.

7 . . . Conveyor system delivers valve bodies from qualifying operations to the first of two sections of one of the Heald lines. Loading of 94 pallets in this line is semi-automatic (fork places part face up on two pins, then nut runner clamps it to the pallet). Cycle time is 18 sec per station.



8 . . . Core drilling of spool bores in valve bodies is done before reaming. Bores are air-gaged for diameter size only. Any out-of-tolerance condition is indicated by lights, so that the machine can be shut down at operator's discretion. In this section of the line, machining includes four core-drilling operations, seven semi-finish reaming operations, five facing and seven air-gaging operations. Two separate cooling systems are employed. Water-soluble oil is used for drilling, tapping and similar operations: mineral oil for reaming to close tolerances



High-speed power quill cuts double-end aluminum cam for typesetting machinery. Cutter speed is adjusted at control box on top of lathe headstock. Chain drive from lathe spindle operates tracer spindle at same speed

Carbide mills aluminum cams to 2 tenths

Small-diameter cutters rotate at 25,000 rpm to cut helical barrel cams that have too much throw to allow single-point turning. Tracer attachment, high-speed power head, and engine lathe are combined to produce these accurate cams

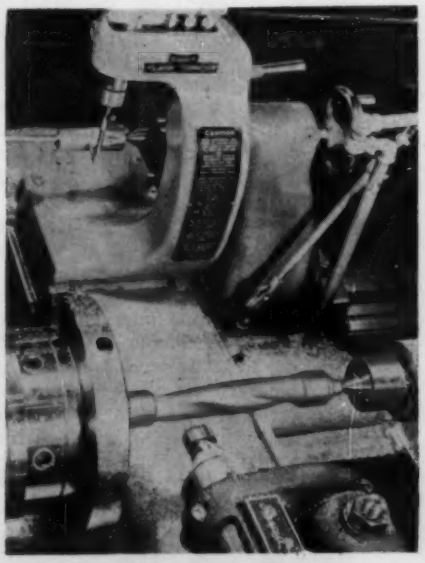
By Harold Lietz, manager, service engineering,
The Sidney Machine Tool Co, Sidney, Ohio

Ball-end milling cutters machine deep contours in aluminum barrel cams on this converted lathe. In spite of the power head, tracer attachment, and chain drive to the tracer spindle, the lathe can be quickly reconverted for standard engine-lathe operations.

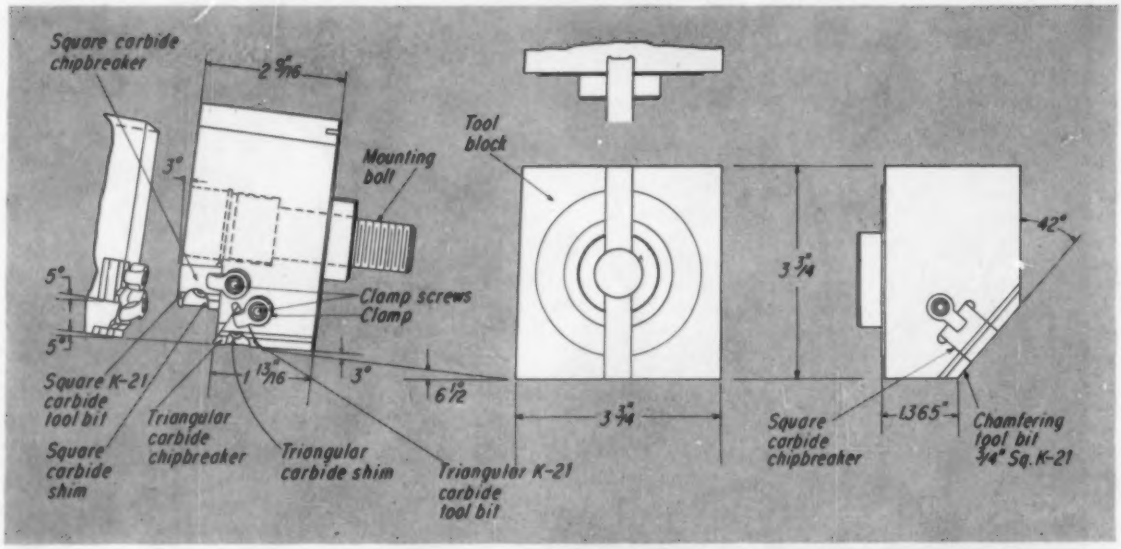
Setup is made on a Sidney Model 32 "Dial Master" machine equipped with a "Fluid Tracer" control system. A 15:1 speed-reduction unit was built into the lathe to reduce spindle speed so both the work and the master cam could be rotated at 3.8 rpm Regular lathe work can be done by removing the ½-in.-pitch chain from the two sprockets and by locking out the special reduction unit.

Solid carbide cutters with spiral flutes and ball nose ends do the machining. Roughing is done with a ⅜-in. cutter at 0.060 ipr, cutting 3/16 in. deep to within 0.040 in. of finished size. Finishing cuts are made with a ⅛-in. cutter at 0.005 ipr, both cuts at 3.8 rpm of both work and master, and both with the power quill running at 25,000 rpm. The quill is a Precise "Super 80" with 1½ hp, and is mounted on the compound slide in an adjustable swivel support.

Slower cutter speeds are possible with the quill when more difficult materials are to be machined. The aluminum barrel cams are cut to well within a tolerance of 0.0002 in. after polishing. Cam dimensions are 5 in. long, 1¾ in. dia, and 4¾ in. along the actual cammed surface. Material is 2017-T4.



Tracer controls power quill by following a half-length master that is reversed when second end of cam is machined. The two cuts are matched by adjusting the master when it is turned end for end



This is how Caterpillar planes steel plate today . . .

PRESENT TOOL BLOCK, designed by Kennametal for form-planing edges of steel plates, has a square and a triangular K-21 cemented-carbide insert clamped in the forward face (for machining stepped faces), and a square K-21 carbide insert on the rear face to cut the chamfer. Block is automatically turned 13° as table reverses

Carbide inserts, oscillating tool blocks, two-way planers add up to . . .

A faster way to plane steel

Stands to reason a planer that cuts two ways will do the job faster than a one-way planer. Add to that K-21 tungsten-tantalum carbide throwaway bits in oscillating tool blocks and you get a drastic cutback in time required to plane edges of SAE 1020 steel plates.

That's the secret of Caterpillar Tractor Co's success at its Decatur, Ill, plant, where average cutting time on a 5-ft-long steel plate has been cut from 15 to 5 min, and cutting speed has been increased from 75-90 fpm to 250-300 fpm. Tool life has been increased from 24 pieces per grind (with HSS form tools) to 33 per cutting edge (with carbide throwaway bits). Average feed was once 0.025 in. per table cycle: now it's 0.014 in. per table stroke (forward or reverse), or 0.028 in. per table cycle.

In Caterpillar's old planing operation, cutting was done only as the planer table moved forward—now it is done on both the forward and return strokes of the 16-ft-long table of a Gray 48 x 48 in. planer. Tools feed inward each time table-travel direction reverses.

Caterpillar is now planing 3 or 5-ft-long, ¾-in.-thick parts, finishing them to a width of 7⅞ in. Opposite edges are form-planed and chamfered (see sketch at right) in preparation for submerged-arc welding.

Plates are mounted in two rows along the 16-ft-long planer table, so that the two outer edges of each setup can be machined by the two oscillating heads on the planer rail. Each tool takes one, two or three interruptions in the cut, depending upon the length of individual parts in each row.

On each setup, parts in the right-hand row are machined on the second side, as parts on the left-hand row are machined on the first side. Left-side parts are then transferred to the right side, and a new set of parts is lined up on the left for the next machining cycle.

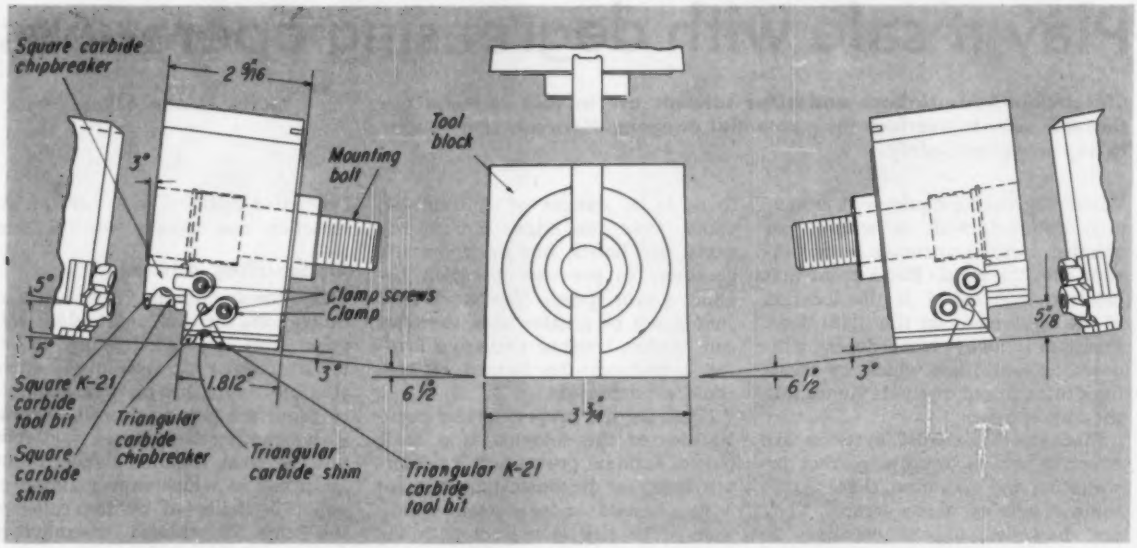
The stepped form is planed during the forward stroke, and the chamfer cut on the return stroke.

Kennametal Inc developed oscillating tool blocks for edge-forming cuts, then adapted them to using cemented-carbide inserts. These blocks have a ¾-in.-square carbide insert and a ½-in. IC triangular insert clamped to their forward faces —and a ¾-in.-square carbide insert clamped at a 42° angle in the rear faces (see the illustration above).

No tool breakage was experienced during actual cutting, but several top facing bits were broken during return strokes (while the chamfering bits were cutting), because chips were dragging under the tool blocks and wedging against the bits.

For that reason, air hoses were clamped to the two clapper boxes, so that air streams would blow chips from the top surfaces of the work. But, while this helped considerably, the hoses were frequently knocked out of position. This problem, in turn, was solved by drilling air passages in the tool blocks, then connecting the hoses to them. In this way, tool breakage was virtually eliminated, despite interruptions in each cutting cycle, caused by in-line loading of parts.

But Caterpillar and Kennametal engineers still aren't satisfied that machining time can't be cut even more, maybe as much as 50%, by redesigning the tool blocks (see sketch on top of opposite page) so that they will allow machining of the stepped cuts on both the forward and return strokes—and by cutting the chamfers with single-point tools mounted on the clapper boxes.

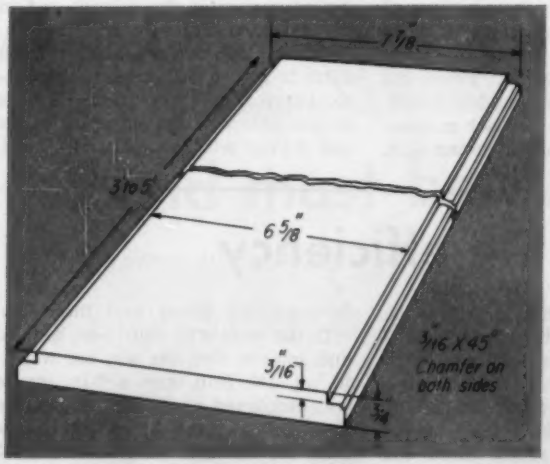


. . . and how it may do the job in the future

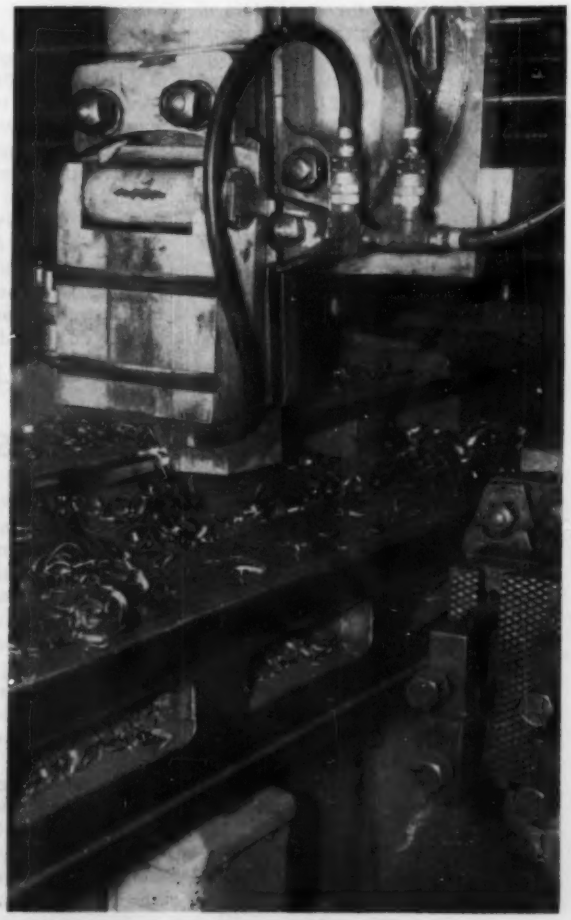
BUT MACHINING TIME MIGHT BE CUT ANOTHER 50%, Caterpillar and Kennametal engineers think, if this tool block were to be used. Block would cut the two stepped faces during the forward and return strokes of the planer table. Single-point carbide-tipped tools would be positioned on clapper boxes to cut the chamfers

plate edges

By Delmar E Baker, carbide engineer
Kennametal Inc, Chicago



This is how edges are planed . . .
from ¾-in., hot-rolled SAE 1020 steel pieces, which are either 3 or 5 ft long



Oscillating tool block . . .
. . . (under right head of planer) is shown turned so that two K-21 inserts (front face) cut the stepped form along the work's edge during the forward stroke. A hose is connected to a passage drilled in the block, directing an air blast that prevents chips from collecting on work surface

Play it safe with degreasing operations

Chlorinated hydrocarbons and other solvents are in such common use that it is easy to overlook their potential dangers. Here are some points to improve plant safety.

By Henry Allen

Vapor degreasing equipment is usually designed, with or without an exhaust system, so fumes cannot escape into the shop. But a point that is often overlooked is the location of the equipment on the plant floor. Position it away from doors, windows, or ventilators which, by creating drafts, might dissipate fumes into the atmosphere.

Mechanical exhaust systems are effective where, despite correct installation and operation, there is still some danger of vapor escape. They are, however, only a corollary to proper design and installation, although they may be useful, particularly with hand-operated tanks.

The first essential is to have the equipment adequate for the work load, so that when it is operating, the distance from the vapor level to the top is at least three-quarters of the operational width of the tank. The aim is to expose as little vapor-emitting area as possible. Vapor level is important, and it is sound practice to install a thermostat in such a position that, if the level rises abnormally, the heat supply will be cut off. The cooling system with its condensing surfaces must be adequate to balance out the highest degree of heat supply, so vapors will be fully condensed.

Techniques of suspending and dipping the work should be such that there is no danger of spilling the vapor over the edge. For heavy parts, use hoists, but incorporate a governor to prevent operation beyond a safe speed. The work load should not be greater than the tank can handle, because excessive loading introduces the hazard of too-rapid condensation.

Knowing the properties and peculiarities of the solvents is a basic part of accident prevention. Trichlorethylene, for instance, may present a fire hazard under certain conditions. The risk is mainly with the sludge which collects at the bottom of the tank and contains metal chips and dust. Inspect tanks regularly and remove the sludge. For safety's sake, deposit the sludge in closed containers for disposal.

Carbon tetrachloride is an excellent grease remover, and it evaporates without leaving a residue. However, it evaporates quickly and mixes freely with air, when it may be dangerously toxic. Maximum allowable concentration is usually taken as 25 ppm for an 8-hr shift, but 10 ppm is preferable. Another potential hazard is that prolonged contact with solvents such as ethylene dichloride or perchlorethylene can produce dermatitis. From the very fact that they have affinity with fats, many solvents can act as powerfully on the fat in the human skin. Protective clothing and operator instruction can usually control this.

Air Sampling Advised

List the maximum allowable concentration for all degreasing solvents, and it is good policy to establish regular air sampling to make absolutely sure that no toxic amounts of vapor are being released. Several such sampling methods are available, but the most common is the halide lamp test in which concentration of vapor is indicated by the color of the flame. The chloride liberated on ignition of the vapor reacts with a copper screw in the flame to produce a greenish color in the flame above. For trichlorethylene, the relation between the appearance of the flame and the vapor content is:

Slight trace of color, 45 ppm
Faint but definite green, 56 ppm
Bright green, 80 ppm

Ventilate tanks thoroughly before entering to clean or repair them, and make a careful check that the inside atmosphere is safe. Keep inspected and tested breathing apparatus close at hand. Instruct all employees in the properties of the solvent and in the precautions necessary in handling it. Do not allow degreased parts to dry in the general shop atmosphere. Make sure that there is proper provision for emptying tanks and piping with complete drainage.

Moly disulfide doubles file efficiency

Application of a simple sprayed coating of colloidal molybdenum disulfide in alcohol (Dag 1127) to the surface of ordinary files has been found to increase the cutting ability by as much as 50%. A standard spray gun was employed, and the material was diluted with toluene to a suitable spraying consistency. Sparked by the personal experiments of an Acheson engineer, the tests were made by two companies of the British BSA group, using standard files and a Herbert file tester.

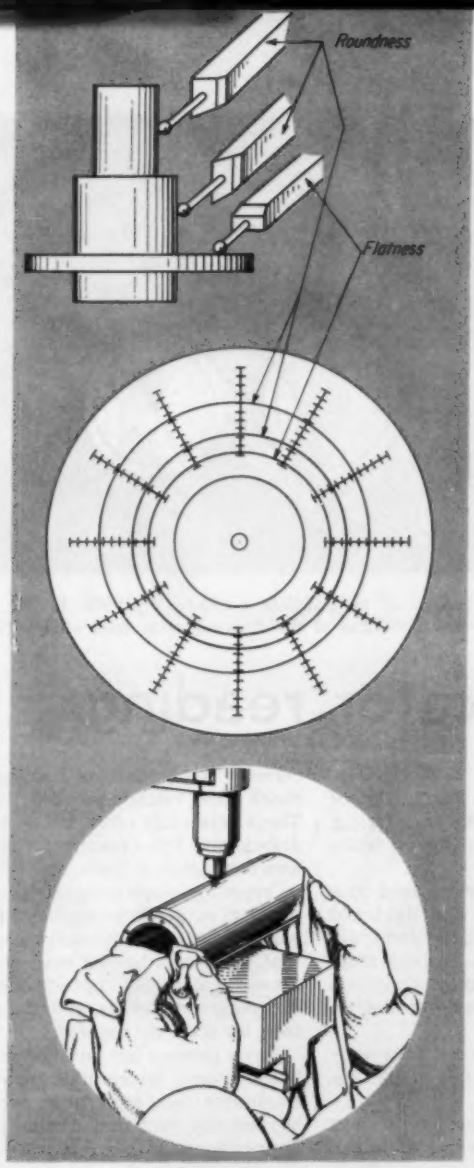
First trials were made with 12-in. bastard files rubbed 30,000 times on a steel bar under constant pressure, the amount of steel removed being the measure of the file's performance. It was found that the untreated files removed 9.0 linear in., while the treated files removed 10.2 in.

Further tests were then made with 12-in. smooth and 6-in. three-square files. Even better performance was obtained; the treated smooth file removing 1.2 in. as against 0.8 in. for the untreated, and the three-square treated file removing 1.0 in. as against 0.6 in.

The percentage improvement appears to vary with the fineness of the teeth and is attributed to the fact that the treated teeth did not clog as much as usual. Apparently the coating acts as a parting agent between the filings and the teeth.

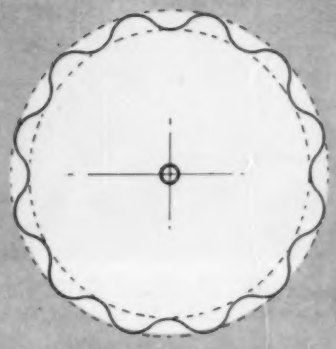
In the tests with the 12-in. bastard and smooth files, the test bar was 1-in. sq, 187 Bhn, and a 6-in. stroke was employed at 55 strokes per min at 31 psi. For the 6-in. three-square files, the test bar was 1 x ½ in., 235 Bhn, with a 3-in. stroke at 55 per min, and 31 psi.

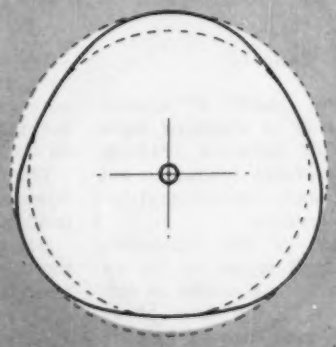
A sideline advantage is the excellent appearance of the treated files which provides a definite sales advantage. Additional tests were made with colloidal MoS_2 in toluene (Dag 1207), but this required a heat-curing treatment that had a tempering effect on the file, and tools so treated showed no improvement over untreated files.



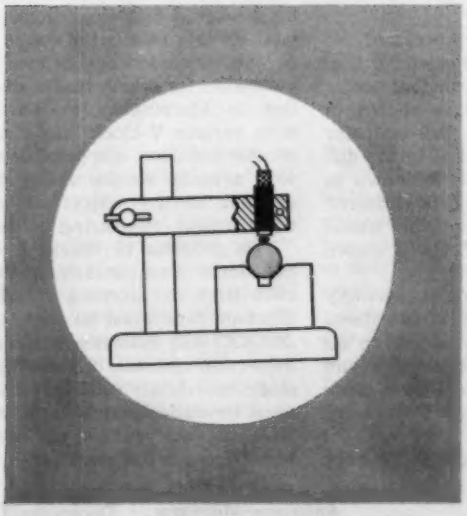
American Machinist

Special Report No. 467
December 1, 1958





"And must be round within . . ."



An AMERICAN MACHINIST reader, William G Canfield, started something when he sent us an article objecting to the common drawing note "And Must Be Round Within .XXXX Full Indicator Reading." Existing literature, he said, does not provide the inquiring mind with much information on accurate measurement of out-of-roundness.

Dimensional tolerances on parts are constantly being reduced; geometrical accuracy is becoming increasingly important. For these reasons, the editors of AMERICAN MACHINIST asked a number of gaging authorities to comment on the basic problem raised by Mr Canfield. This Special Report is therefore the first-known compendium of up-to-date opinion, advice and methods to be assembled on the problems of determining out-of-round, lobing, and variations from geometrical concentricity.

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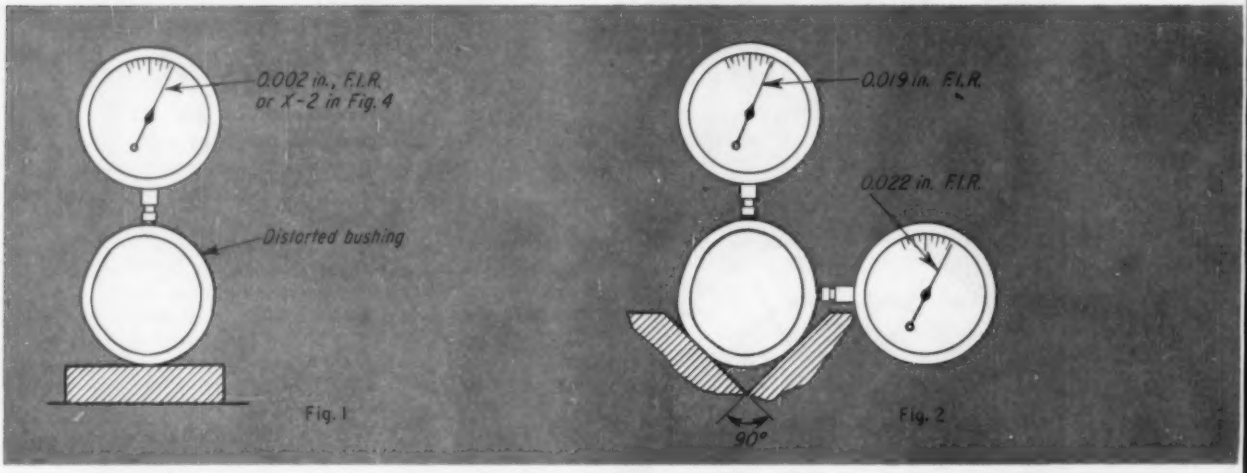


Author's experiments demonstrate that a purposely distorted bushing (3 lobes) cannot be measured accurately for out-of-round by diametral methods, Figs. 1-3. In Fig. 4, he shows deviations of the flattened areas from circularity, with

.XXXX" full indicator reading

By William G Canfield

A diametrical check at several places may lead to accepting parts that have full indicator readings well within specified tolerances but which are actually out-of-round beyond such tolerances.

General use of this inaccurate checking method is due to the assumption that if a diameter is out-of-round it is in the form of an ellipse that may be checked by comparing measurements taken at the major and minor diameters.

3-Lobed Condition

One common cause of out-of-round work diameters, which cannot be measured accurately for out-of-roundness by several diametrical measurements, is 3-way out-of-round wear of machine spindles. This causes the spindle to act like a cam and to reproduce its out-of-round ness, relatively, in the diameters being machined.

Other factors in centerless grinding can and do produce out-of-round conditions other than practically true ellipses.

The improper use of a 3-jaw chuck on a machine with a work spindle in first-class condition is another cause of producing 3-way out-of-round diameters.

However, existing literature does not provide the inquiring mind with much information on how to measure out of roundness accurately. Suppose we take a simple case of out of roundness:

A steel bushing, approximately 1.000 OD by 0.800 in. ID by 9/16 in. long, was made by chucking a piece of barstock in a lathe and facing, boring, turning, and cutting-off while in one setting.

The bushing was then placed in a 3-jaw universal chuck and tightened until it was considerably distorted.

After removing the bushing from the chuck its out-of-round condition was visually evident, when rolled on a flat surface.

A ring was next bored to a very light press fit on the OD of the distorted bushing.

A dial indicator was set up over a flat surface and several diametrical checks for roundness were made of the bushing in the generally accepted manner, Fig. 1. The results were far from being in keeping with those evident when the part was checked visually and when rotated between the fingers.

The results of other checks of the same bushing are indicated in Fig. 2, 3 and 4. The only one that seems to approach accuracy is shown in Fig. 4. The 0.002 in. full-indicator reading in Fig. 1 is equal to the difference between *X* and *Z* shown in Fig. 4. Hence, it may be inferred that the full-indicator reading would have been zero if *X*, *Y*, and *Z* shown in Fig. 4 had been equal.

This experiment only partially covered a 3-way out-of-roundness check. More light is needed on an accurate method to check this and other out-of-round conditions, such as out-of-round 5-ways, 7-ways, or any uneven spacing.

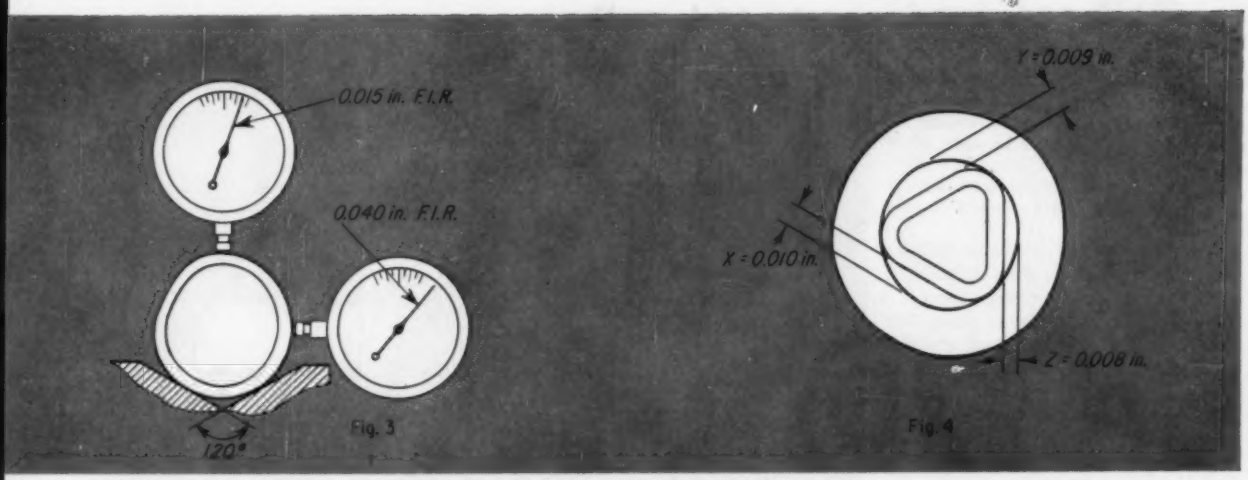
As a gage-design analyst I have rejected many designs for gages to check out-of-roundness diametrically. These rejections often led to heated discussions. The experiment outlined was conducted to back up my stand in rejecting such designs. Even the physical evidence brought out by the experiment did not change opinions that, diameters having been checked diametrically for out-of-roundness for years and years, it was, therefore, an accurate method.

Some persons are familiar with V-block checks which indicate out-of-roundness but with little accuracy beyond the fact that a diameter is out-of-round.

Loosely Defined

An article "How Round Is Round?" by Albert C Sanford of Federal Products (*AM*—Nov 10 '52, p 124), states that out-of-roundness cannot be measured by conventional methods. He says that out-of-round is one of the most loosely defined characteristics for which limits are specified on blueprints. He shows that with various V-block angles and indicator positions, it is possible to provide a fairly simple visual demonstration of the effects of various out-of-round measuring methods.

The problem in checking out-of-roundness diametrically appears to stem from the wording of the specification, "and must be round within .XXXX" full indicator reading." An inspection manual, or drawing note, might specifically state that the check must be made diametrically, but can well be written by someone not familiar with the problem.



respect to an undistorted ring lightly pressed onto the bushing. Note: In Fig. 3, the 0.015 and 0.040 in. F.I.R. readings (full-indicator readings) equal twice the sum of *X*, *Y*, and *Z*. Fig. 4, plus one half the difference of *X and Y*

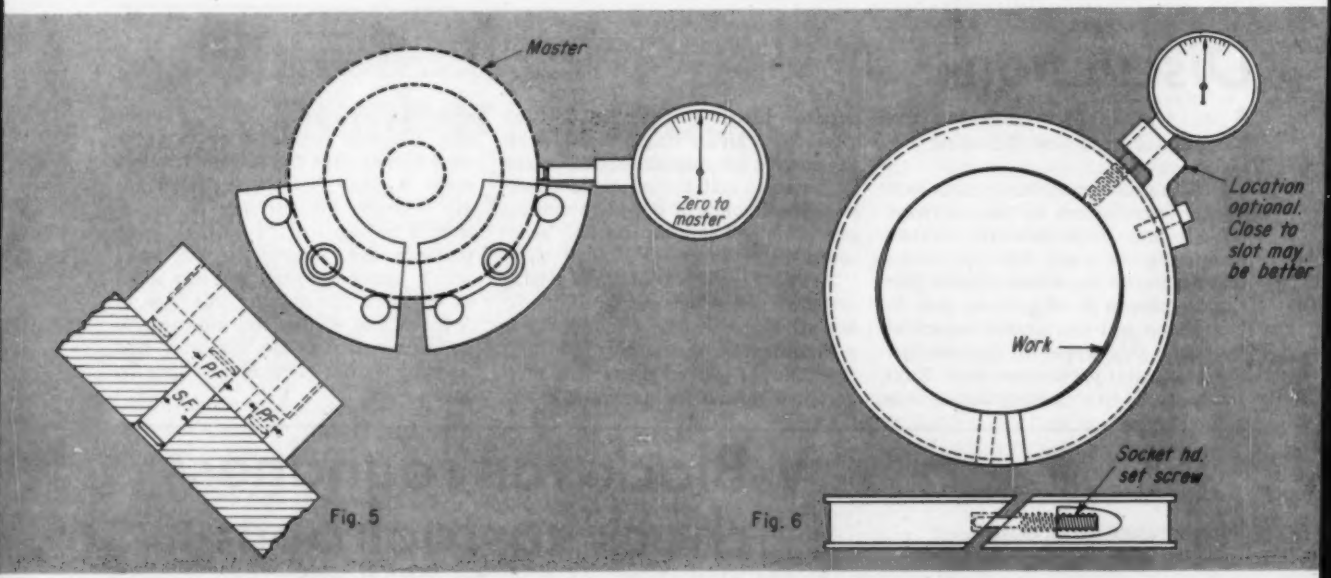


Fig. 5—Modified "V-block" suggested by Canfield is based on the principle of self-adjusting or swivel jaws, to check the part from the center and indicate average diametral and radial variation from roundness

Fig. 6—A roundness gage that is a modification of the experiment in Fig. 4, the ring is slotted, sprung open about 0.005 in. and the ID ground to the nominal part diameter. After the ring is placed on the part and adjusted to a slide fit with the socket-head setscrew, the gage or part is revolved and the dial indications noted. Possibly the accuracy of this setup will be within 10% of the 10% tolerance error permitted by quality review

If the specification is written to indicate a radial check such as, "And total radial variation must not exceed 0.001 in.," it will indicate an approach to gage designs for out-of-roundness checking. In other words, it would be based upon the conventional check used every time a diameter is centered on a jig borer, lathe, grinder, or boring mill. Here any out-of-roundness and its extent, radially, is accurately apparent as soon as high or low points of a diameter are trued-up radially from a reference center point.

My thoughts on lobing are that lobing is out-of-roundness and out-of-roundness is lobing. The permissible extent of such can be indicated in specifications covering radial tolerances.

Relative to my omission of a remedy for the checking problem, Fig. 5 is submitted as a modification of the fixed V's used in the Sanford article and in my sketches, Fig. 2, 3 and 4. Fig. 5 indicates a method based upon chucks having swivel jaws that do a good centering job on forgings that are out-of-round to variable degrees. Further modification might produce more accurate results. See also Fig. 6 for a modification of the setup in Fig. 4.

In precision steel ball production, a very peculiar condition arises at times. Balls in some lots visually resemble a cluster of pyramids, but no known ball checking gages will detect the error. Fig. 7 shows a basic method, which could be modified for automated setups.

"...and must be round within..."

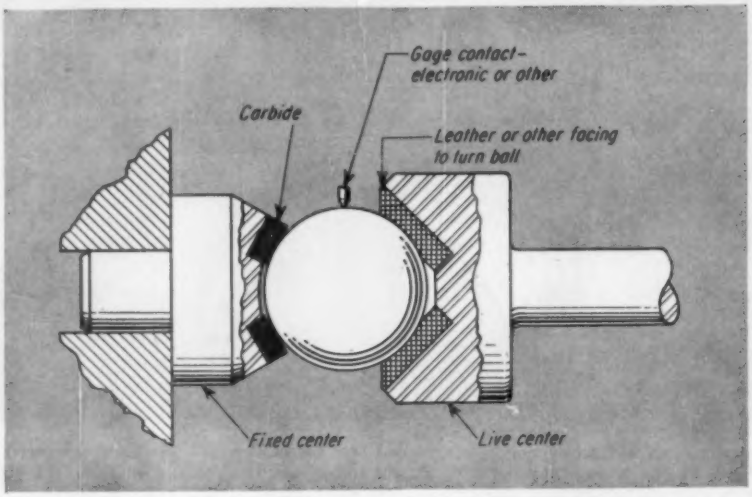


Fig. 7—Radial detections of variations in sphericity of a ball might be detected with this setup, according to Canfield

Discussion

F Meyer, Jr, manager,
Instrument Gage Div, Taft-Peirce Mfg Co

After reading Mr Canfield's contribution, I have the following remarks:

1. The problem of three-point out-of-roundness comes to our attention quite often. This condition occurs frequently on work that is centerless ground or centerless lapped. The three-nozzle type of air-ring gage is one of the well-recognized means of checking this type of dimensional variation on a production basis. Furthermore, in centerless grinding it is possible to get five, seven, or nine lobes. With an air ring designed with the correct number of nozzles, equally spaced to match the lobular condition, the amount of out-of-roundness and diameter can be checked accurately.

2. The Talyrond roundness testing machine is another means of checking all types of out-of-roundness to a high degree of accuracy.

3. The article neglects the most accepted means for gaging this out-of-roundness directly. The V-block and indicator means of checking is well known, but the author has not made it clear that the included angle between the surfaces of the V should be constructed so that these surfaces are tangent to the radii which bisect the high and low lobes of the part. By making this type of V-block and setting the indicator to suitable masters, the diameter and amount of out-of-roundness can be measured.

V-Block for roundness check in toolroom

A N Appleby, toolroom supervisor,
British Thomson-Houston Co, Ltd,
Rugby, England

Suppose that a shaft 1½ in. dia is to be made within 0.001 in. clock reading. In effect the requirement means, 0.0005 in., as I will explain.

A comparator and a precision V-block of 60° included angle are required. If comparator alone is used many shapes of truly irregular contour can be made to appear round, and this often leads to dispute in assembly.

A useful size of V-block for toolroom work is shown in Fig. 8.

Distance C from the base of the V-block to the apex of the V is known. For any shaft that will rest in the V:

$$R = \frac{H - C}{3}, \text{ and } H = 3R + C$$

The comparator can be set to height H with a stack of gage blocks. Now with the shaft resting in the V-block, the piece can be rotated and readings taken at specific points around the periphery. In effect, you gage the radius, and the setup averages the lobes by three-point contact. The measurements can be plotted with respect to various positions around the circle, whereas the clock reading method is merely comparative.

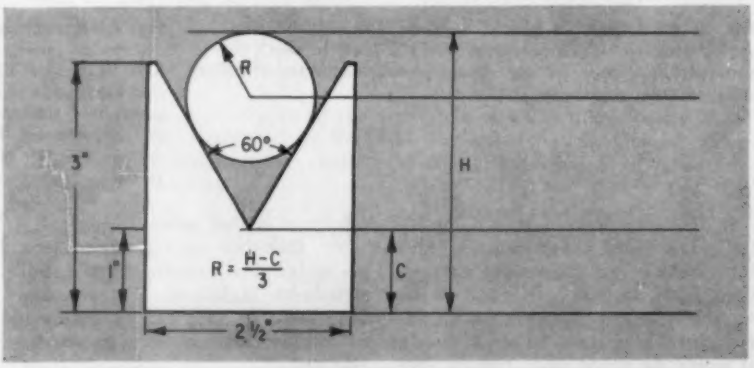


Fig. 8—By means of the formula supplied, the setting height H for the comparator can be figured for all diameters that will rest in the V

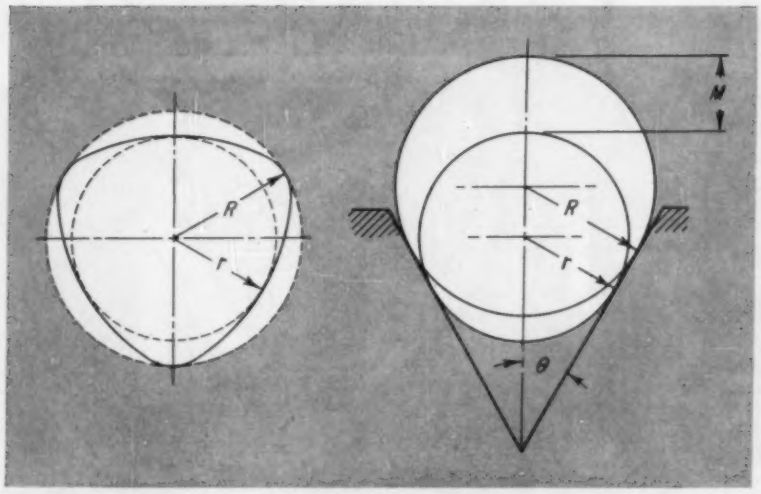


Fig. 9—Workpieces with an odd number of lobes can be checked accurately for out-of-roundness, according to Worthen, if the included angle 2θ of the V-block is selected properly and by applying an appropriate multiplying factor to the tolerance to find the TIR

V-Block angle depends on number of lobes

John Worthen, gage engineer, Federal Products Corp., Providence, RI

Admittedly, the condition known as "out-of-roundness" is not clearly understood by some people in the metalworking industry.

There is certainly ground for argument that if out-of-round is specified on blueprints as a function of variation in radius, misunderstandings and incorrect gaging techniques can be avoided. On this premise we feel that out-of-round tolerances should be defined in these terms:

"This part must be round within 0.xxxx in. **variation in radius.**"

Mr. Canfield's discussion suggests this way of specifying the limits of an out-of-round condition. If we interpret his remarks correctly, he implies that any gaging of the part should be accomplished by establishing an axis of rotation and reading radial variation directly. We do not agree.

We hold that the part can still be checked reliably in the conventional manner, using either a regular comparator or V-block arrangement, depending on the number of lobes involved, without having to resort to a more involved fixture. The relationship between radial variation and comparator or V-block measurement can be expressed in terms of a simple multiplication factor.

In *all* cases where there is an even number of geometrically arranged lobes involved in the "out-of-round" condition, each lobe will be opposed by one diametrically opposite. The piece, therefore, can be considered to have major and minor diameters. This permits its being gaged on a regular comparator of suitable accuracy, in which case the above-mentioned multiplication factor will be 2, meaning that the TIR (Total Indicator Reading) will be twice the actual radial variation allowed by the specification.

When an odd number of lobes exist, the piece would be gaged in a V-block fixture. The included angle of the V-block and the multiplication factor will depend on the number of lobes involved. The included V-block angle, 2θ, is computed from Formula 1 in the footnote, and the multiplication factor is the term $(1 + \csc \theta)$ in Formula 2. However, the table below, worked out from these formulas, gives the required multiplication factor and included V-block angle for 3-, 5-, and 7-lobed conditions. These constitute practically all the out-of-round conditions involving odd numbers of lobes encountered in practice.

CONDITION	MULTIPLICATION FACTOR	INCLUDED V-BLOCK ANGLE
Three lobes	3	60°
Five lobes	2.24	108°
Seven lobes	2.07	138° 40'

Let us take a specific example:

A part is specified by the design engineer to be "round within 0.0001 in. variation in radius." The tool or gage engineer, or responsible inspector, would determine how many lobes would be involved by determining how the part is to be machined. If he finds that it will have a 3-point out-of-round condition, he will plan to gage the part in a 60° V-block fixture, as is conventional. To determine the allowable Total Indicator Reading, he merely multiplies 0.0001 in. by 3 and the gage operator is told that any TIR of more than 0.0003 in. indicates an unacceptable piece.

This discussion has been concerned primarily with out-of-round conditions involving geometrically arranged lobes or points. While nongeometric out-of-round conditions occur frequently, they normally will be evidenced by irregular travel of the indicator.

We believe that any manufacturer who designs gages for measuring out-of-round conditions would certainly like to see the industry educate itself to a universally acceptable specification which is not susceptible to mis-interpretation. We believe that the one suggested above meets these requirements and that the foregoing discussion explains a simple and reliable means of correlating conventional gaging to this type of specification, so that it could be instituted without the penalty of requiring a more costly means of determining part acceptability.

Derivation of Formula

1. The basic formula for determining the proper included V-block angle (see Fig. 9) is:

$$2\theta = 180 - \frac{360}{n}$$

Where: θ equals half the included V-block angle
n equals the number of lobes

2. The basic formula for determining what Total Indicator Reading will reflect the specified radial variation is derived from the geometry in Fig. 9 and is stated as:

$$M = (R + R \csc \theta) - (r + r \csc \theta)$$

or

$$M = (R - r)(1 + \csc \theta)$$

M = Measured difference (as shown on indicator)
R = Radius of circumscribed circle
r = Radius of inscribed circle
θ = ½ included angle of V-block
$R - r$ = Specified radial variation (tolerance)

"and must be round within..."

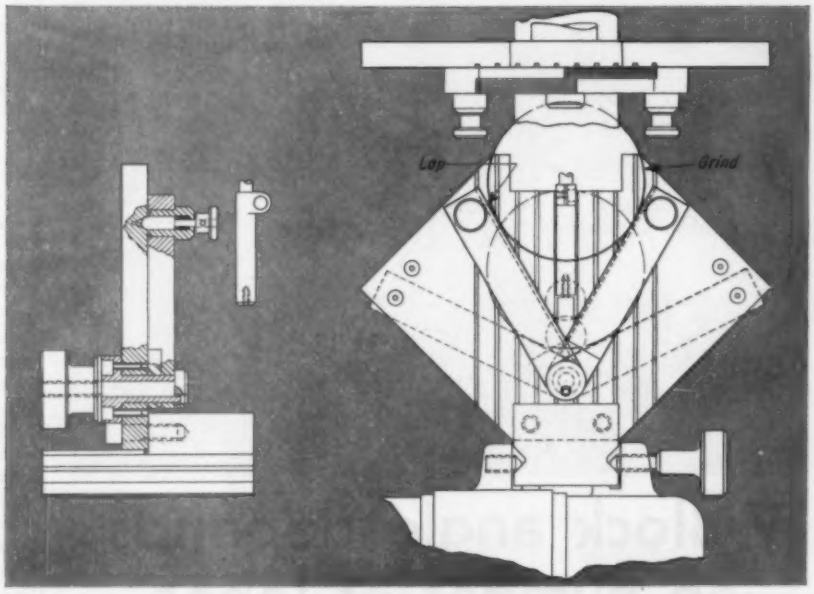


Fig. 10—After the lobing condition of the work has been determined, this adjustable V-anvil devised by Pratt & Whitney can be set up to check parts ranging from ¾ to 3 in. dia

Adjustable V-block used for machine checkup

C A Whitney,
chief engineer
Gage Div, Pratt & Whitney Co

As dimensional tolerances on parts are continually being reduced, roundness requires a closer study. It is very true that diametrically checking diameters for out-of-roundness at several places, "is not a theoretically accurate check." However, it must be generally concluded that on the majority of parts that have large tolerances for roundness, (bushings, etc. that are to be later rounded up in the hole they are inserted into) that this method will give satisfactory results. This method, and variations of it using V-blocks, is widely used and generally is the accepted practice in industry today.

Experience indicates that setups on machines and different machines cause different lobing conditions. This causes a real problem in checking because the number of lobes is not known. An excellent solution to the problem seems to be the approach many are using today of checking accurately the lobe condition at setup of the particular machine. This check is generally being done on the "Talyrond" (page 118) to show up the lobing condition that the machine is producing and the amount. After the lobing condition has been observed, a simple adjustable V anvil, Fig. 10, can be set up to check all the parts the machine produces, rapidly and efficiently, or a fixed V can be made to fit on an "Electrolimit" comparator and further checking is routine.

When checking roundness is a requirement on an automatic machine, electronic circuits have been developed that will read the total lobing condition without regard to dimensional changes on diameter or radius.

In conclusion, it would appear to me in dealing with all the parts we do as gage makers, that the configuration of the part and the methods of manufacture have to be the prime considerations before any final and conclusive method for measuring the out-of-roundness is decided upon by the shop.

electronic gages check

P E Carbone,
design supervisor, Precision Tool & Gage Group, Brown & Sharpe Mfg Co

Both articles—Mr Sanford's "How Round is Round," and Mr Canfield's "And must be round within .xxxx full indicator readings"—cover the subject matter quite thoroughly. The problem of checking out-of-round conditions has been encountered by gage makers and inspectors for some time, and presumedly methods or standards for checking have been established with each manufacturing plant or shop. However, the question posed here appears to be whether these separate standards are adequate; and, perhaps, try to arrive at an industry-wide standard for inspection of "out-of-round" conditions. Whether this would be acceptable or not remains questionable.

We have had occasion to build several gages, as shown by Mr Canfield's sketches, and illustrate one that employs the principle shown in his Fig. 6. These gages are electronic devices used in conjunction with our standard amplifier and are capable of detecting increments of 0.00001 in. This principle, we feel, is the best for measuring or checking out-of-round.

Lobing of cylindrical features and its measurement

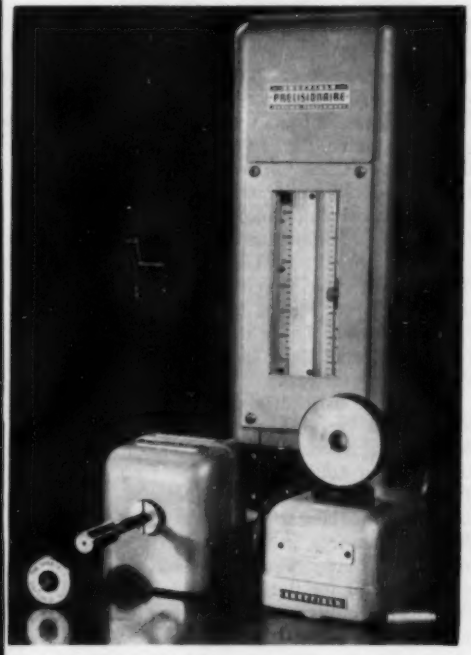


Fig. 12—Measurement of male and female cylindrical parts is made for lobing and assembly by size classification. Spindle unit on left has three jets for checking size and lobing of female part. Air ring gage on right with three jets inspects male part for lobing and size. Each gage has flow-type indicator which is also used for selective size control in assembly of male and female parts

W J Darmody, Col., USA (Ret)
technical executive assistant,
The Sheffield Corporation

Sometimes a cylindrical fit will not assemble even though precise measurements of the male and female parts show that they should assemble with a clearance. Analysis of this condition usually discloses that the measurements were made by devices having diametrically opposed contacts such as a micrometer caliper or an adjustable bore gage.

Such measuring devices do not measure the "envelope" or complete circumference. They will detect elliptical types of out of round but not a type commonly referred to as "lobing." Names for this geometrical freak in the form of features of constant diameter that are not round are numerous and vary from shop to shop. Some call it "cloverleaf," others describe it as "watermelon" chatter. Paul M Mueller, in an article on precise cylindrical lapping (*Mechanical Engineering*, Vol. 47, No. 9) mentions a three-lobe "isogon" that sometimes results from cylindrical parts produced by centerless lapping techniques other than ring lapping.

All causes of lobing are not known. In an article on the "Theory and Practice of Centerless Grinding" (*Mechanical Engineering*, Vol. 47, No. 9), W J Peets mentions it as being produced under certain conditions in this type of machining. Some conditions of centers on which work is rotated, or non-concentric functioning of machine bearings, or localized stresses introduced by workholding elements may cause lobing of either external or internal cylindrical features. Regardless of its cause, the important matter is for production and inspection to detect lobing and eliminate it where it may adversely affect product function or assembly.

The customary shop technique for detection of lobing is V-block measurement with a comparator. The work is rotated to measure the rise and fall of the workpiece if it has lobes. The number of lobes may vary from three to many. An odd number of lobes is the fundamental characteristic that requires V-block measurement. If a part has an even number of lobes it can be measured by diametrically opposed contact types of measurement, provided the lobes are spaced far enough to permit the measuring contacts to explore for minimum-metal conditions.

In today's concept of surface roughness, which embraces the characteristic of "waviness," there may be some question as to whether a part is lobed or has a wavy surface. In any event the technique of V-block measurement is usually necessary where there is an odd number of lobes or waves on a cylindrical surface.

A V-block with 120° included an-

crankshaft roundness

Fig. 11—An electronic caliper was supplied to an automobile manufacturer by Brown & Sharpe to check out-of-roundness of crankshaft journals to 0.00001 in.

gle would probably show the maximum value of a piece having three lobes. A 90° V-block will usually indicate the presence of lobing.

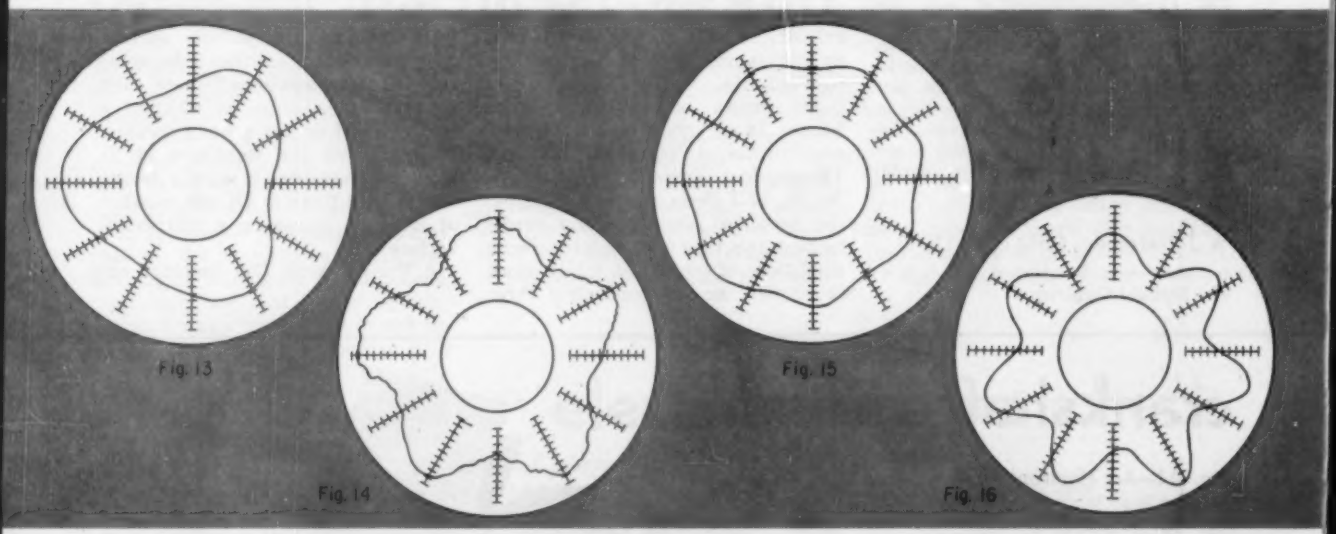
The measurement of thread-measuring wires requires a roundness check while the wire is rotated in a 60° V. This setup duplicates the functioning of the wire in pitch-diameter measurements. It is important to know true wire roundness values, because they can introduce errors magnified by a factor of three due to the position of the wire in the 60° thread. Thread wires for 29° threads should be checked for roundness in a 60° angle V-block.

If the workpiece can be mounted truly concentric without deformation in a very precise rotation device, the lobes can be measured by total-indicator reading techniques. Precise concentric rotation of the workpiece and a hysterisis-free indicating device, such as, the "Airetest Indicator" or "Plunjet Air Gage Cartridge" are essential to attainment of proper accuracy objectives in this type of test.

While lobing characteristics have been known for many years, today's concern about the condition existing need not touch off witch hunts by inspectors or inspire designers to clutter drawings with unnecessary requirements. Where lobing is a suspect, in malfunctions or improper assemblies, there are gaging methods to detect it quantitatively or determine its over-all effect in dimensional interchangeability. Properly designed "GO" plug and ring gages will assure assembly where lobing exists because they check the complete envelope of maximum-metal conditions. Single-element "Not Go" gages, such as snap gages for male parts, may not detect true minimum-metal conditions if lobing exists.

Air gages provide a precise technique for detection and measurement of lobing. In Fig. 12 there is illustrated a three-jet air spindle for lobing detection and measurement of internal cylindrical features. The three jets of the spindle are spaced 120° which has proved to be the most universal arrangement for detection of three or more lobes in an odd-numbered sequence. Fig. 12 also shows a three-jet air ring with jets spaced 120° for detection of odd-numbered lobing conditions on male cylindrical features. An important fundamental of measurement of lobing is the use of the flow-type Precisionaire base unit which is free of backlash and friction effects. These may result in hysterisis, and hide the small rise and fall of the lobes.

Lobing as a quality characteristic should not be viewed as a concentricity requirement to be measured in terms of total indicator reading. It is a characteristic not always related to the center of the feature. Recent advances in gaging and metrology provide versatile and accurate means for detection of lobing, "isogons," "cloverleaf," "watermelon chatter," or whatever it is called.



Roundness charts aid in analyzing and correcting the causes of lobing. These charts show 3, 5, and 7-lobe conditions and were made at various amplifications of stylus movement (Talyrond): Fig. 13—ball; Fig. 14—crankshaft; Fig. 15—servo-valve spool, and Fig. 16—ball-bearing inner race

Lobing measurements in the metrology laboratory

Ray Mahlmeister, director,
The Eli Whitney Metrology Laboratory, The Sheffield Corporation

The detection and measurement of "lobed" characteristics on cylindrical or spherical features is a normal procedure in this Laboratory.

An increasing number of customers using our measurement services desire complete and precise dimensional analysis of parts that have not performed to design requirements

in pressure retention, hydraulic slippage, bearing performance or other extreme engineering characteristics. When such parts are received they are measured in conventional high precision instruments, such as, the N7 internal measuring machine, the "Accutron" comparators and measuring machines, or visual gages. These ultra-precise instruments function for diametral measurement, and a complete analysis of diametral roundness is obtained by selection of several points of measurement.

If the deviation from roundness is elliptical in section or the surface has "waviness" characteristics with an even number of lobes, diametral measurement will usually give adequate analysis. If a cylindrical or spherical surface is suspected of having an odd number of "lobes," a condition not usually detected by diametral measurement, a test procedure is then established using a V-block technique with either an "Airetest Precisionaire" indicator, or an "Electrojet-Accutron" gaging cartridge for indication—or measurement is made in a roundness measuring machine (Talyrond, see page 118) that uses a sweep technique. In some cases, the Laboratory may use special multi-jet "Precisionaire" spindles or air rings for lobing measurements. In these cases the spindle or rings have an odd number of jets, and the most commonly used arrangement is three jets spaced 120° apart.

The numerous problems of roundness measurement that have been submitted to the laboratory have resulted in a chart library of geometrical "freaks" in the form of figures that measure truly round on diameter but are far from having a truly circular section.

In Fig. 13, there is illustrated a roundness trace of a ball. The laboratory has measured balls from one millimeter up to several inches in diameter. This illustration shows a three-lobed condition that would be undesirable in a liquid sealing function, such as, a ball-point pen or check valve. It could also be a dangerous condition in a high-performance aircraft bearing.

Fig. 14 shows a five-lobed condition found on the journal of a crankshaft. This chart was made at 4000 magnifications and the filter used enabled the indication of some of the surface roughness superimposed on the lobes. Such a journal could show rapid wear in service as the five high points could be susceptible to fast wear.

The chart, Fig. 15, illustrates lobing found on the spool of a high-performance servo valve. The chart is made at 10,000 to 1 magnification so that each radial division represents 10 millionths. While the crest-to-trough distance is only about 30 millionths on this part, it could adversely affect precise hydraulic performance on this part.

Fig. 16 is an illustration of a seven-lobe condition found on a ball-bearing inner race. Such a condition could be the result of clamping deformation during machining.

Measurement of roundness to millionths

E J Schneider, vice-president,
Engis Equipment Co, Chicago

Roundness specifications already have recognized the difficulty of testing roundness as such with generally available tools. British Standard 30853, "Engineering Drawing Practice," says: "Where it is necessary to specify the maximum ovality permissible in a cylindrical feature, this should be so noted. Ovality for this purpose is the maximum difference in diameter measurements on any cross-section of the cylinder.

"However, diametral measurements cannot, by themselves, prove that a feature is round. Figures such as those shown (Fig. 17) obviously suffer from errors of roundness even though their diametral measurements are constant.

"Theoretically, errors of roundness or cylindricity (i.e. roundness, straightness and parallelism) could be toleranced by establishing an annular tolerance zone within which the finished surface must lie. However, such a requirement, while being easy to specify, is most difficult to check in practice because of the difficulty of establishing the perfect cylinder with which to compare the finished surface, and also because of the infinite variety of errors of form which may occur."

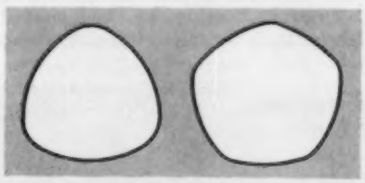


Fig. 17—Lobed figures with constant "diametral" dimensions

Two Problems

Two fundamental problems present themselves:

1. Where to find the perfect cylinder or sphere with which to compare the finished surface;
2. What means to use to determine and measure the "infinite variety of errors of form that might occur."

The answers have been found through high-precision radial measurement with analytical electronic interpretation. One of the world's largest manufacturers of ball bearings catalogs basic sizes from 1/16 to 1 3/16, with sizes available in increments as small as 0.000005 in., sphericity or out-of-roundness held to as little as 0.000005 in. Diameter variation per order size or unit container is held as low as 0.00001 in.

The catalog states: "The Talyrond traces geometrical characteristics of a ball surface—measuring and recording any deviations from perfect roundness at magnification ratios up to 10,000 times. It produces actual graphs of ball sphericity and surface finish that can be read to within three one-millionths of an inch."

The Talyrond roundness testing machine, Fig. 18, has a spindle that runs true to within three-millionths, and on which a stylus measuring point can be rotated around the fixed piece being tested. An electronic method of amplifying the impulse of the stylus is used to produce graphs, which show errors of form for analysis—both as to acceptance or rejection of the piece and as to modification of production methods to eliminate such errors in form.

The gage head is connected through an amplifier to an indicating meter and also to a recorder marking on a circular chart. The chart is geared to the spindle to rotate with it at the same speed, and the marking pen is arranged to move over the chart in a radial direction.

The graph produced shows, geometrically, on a greatly enlarged scale, the variations in radius of a cross-section of the part measured from the point where the axis of the spindle intersects the cross-section.

There are perhaps other ways of visualizing the action. Imagine, for example, a ring gage, true within 0.000003 in., so positioned and of such diameter that it just surrounds the part without touching it as

shown in Fig. 19. Then the Talyrond graph may be deemed to show the variations in clearance between the gage and the part, plotted on a greatly enlarged radial scale as in Fig. 20. The actual diameter of the imaginary ring gage, or of the circle chosen to represent it on the graph does not matter, because only the changes in clearance are taken into consideration. In the case of a hole, one might visualize a plug gage as providing the base circle from which measurements are taken.

The graph does not show the actual shape of the part, but only the departures from roundness, and on a greatly enlarged scale.

The radial ordinates are printed on the chart, and the 1/10 in. divisions along them will provide a convenient radial scale. To allow for slight imperfections of centering, the circular ordinates are printed on a separate transparent sheet under which the graph may be floated about until a "best fit" is obtained.

Interpreting Roundness Graphs

The more or less star-shaped graphs often produced come about because the graphs are not the actual shape of the part. The line of departure from true roundness, plotted to a greatly enlarged scale of magnification, follows around a circle which is not scaled-up in proportion. In Fig. 21 the dotted line is the true circle. Inside this circle is a figure which represents a part slightly flattened on six sides by an amount "x". In the succeeding illustrations, the departures from roundness are scaled-up by a factor of 2, then 4, and then 8. Thus, when looking at graphs of parts, with readings taken at 2,000 or 10,000 magnifications, we must think back to the shape and proportion of the original part to see what the graph really means.

New Definitions for New Needs

Now that instrumentation is available which can provide a complete and direct permanent analysis of all deviations from true roundness of cylindrical, spherical or conical parts, both for final inspection and for analysis of manufacturing process, new definitions of roundness begin to emerge.

One tentative definition states: "deviation from pure circularity is the difference in the radii of two coplanar concentric circles, the angular space between which just contains the profile of the surface."

That radius, and not diameter, should be the basis for roundness measurement has become clear as methods have been made available which supersede the circumference-locating methods such as V-blocks with dial indicators and their lack of precise determination of the lobed condition so common in mass-produced parts.

This concept clarifies specification, and provides repeatable and permanent records which can be used in re-thinking and improving both product design and methods of manufacture in the interests of greater quality and reduced costs.

Acknowledgment

The research and development by R E Reason, head of the Electronic Industrial Research, Taylor, Taylor & Hobson Ltd, England, constitutes the basis for Mr Schneider's contribution and is gratefully acknowledged by him.

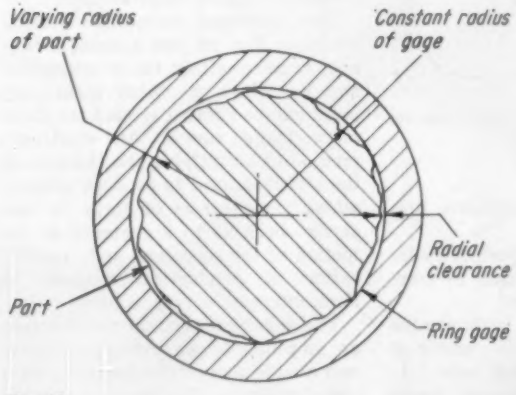


Fig. 19

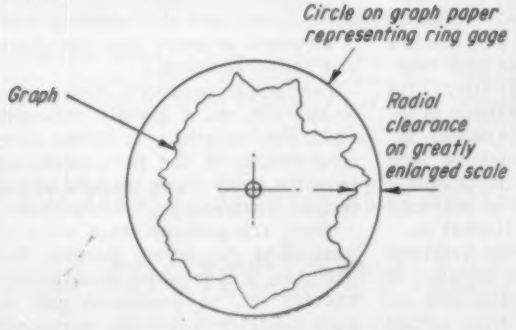


Fig. 20

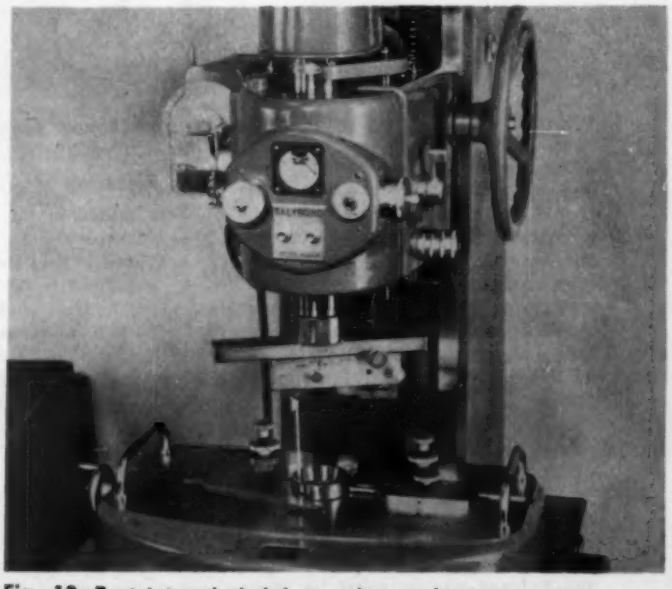


Fig. 18—Part being checked for roundness, a bearing race, is stationary on the table of the Talyrond machine, while a stylus in the electronic gage head affixed to the spindle sweeps the work surface. The gage head is connected to a recorder marking on a circular chart

Fig. 19—Schematic diagram of Talyrond checking of a male part: The ID of the ring gage represents the base circle; the "part" the radial variations from circularity

Fig. 20—Talyrond graph (see also Figs. 13-16) magnifies the radial variations, or "clearance"

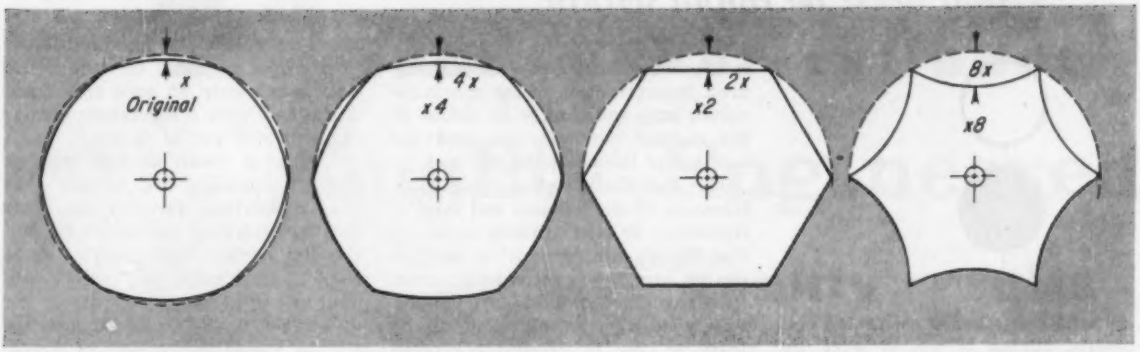


Fig. 21—Talyrond graphs do not represent the actual shape of the part because of the need to magnify radial deviations by 2000 to 10,000 times, according to what conditions are being checked. Therefore, one must by experience, **"think back"** to the actual shape to understand the meaning of the graph

Roundness measurement by radial means

F W Witzke, manager, Sales Engineering, Cleveland Instrument Co

As Mr Canfield pointed out, diametrical checks seldom provide the true picture of the out-of-round condition.

Radial measurements are the only true check of out-of-roundness. The fixture suggested by Mr Canfield in Fig. 6 is a good approach to a radial type check for many parts and tolerances.

Industry has demanded increased accuracy in this type of measurement, and as a result several new instruments have been developed. One approach is rotation of a gage head that is suspended from a precision spindle about the part. The part is aligned with its centerline on the spindle axis, as indicated by minimum variation in gage reading. Out-of-roundness is measured by variations in gage reading as the device is rotated around the part. A recording on a polar chart permits identification of the type of lobing present, 3, 5, 7, etc, or a complex form, as well as the exact magnitude and location of the roundness error.

For maximum accuracy, a frictionless electronic gage head is used along with a slip ring which prevents wind up of the gage head leads about the spindle. Many jig borers have spindles sufficiently accurate to permit out-of-roundness measurements to within a ten thousandth. The Cleveland Ex-Ac rotary indicator is intended for this type of measurement. When used on equipment with ultra-precision spindles such as the Moore universal measuring machine, measurements to an accuracy of several millionths are possible. In addition, it is easy to measure conditions such as bellmouth, taper, lean, concentricity.

A new concept in out-of-round-measurement is employed in the Cleveland Indi-Ron, Fig. 22, an instrument specifically designed for ultra-precision out-of-round, concentricity, and squareness measurements. In this instrument the part is rotated while the gage head remains stationary. See Fig. 23 for application of multiple gage heads. Also see Fig. 24 and 25.

The axis of the part is aligned exactly with that of the ultra-precision spindle on which the part is supported by means of a four-point centering and tilting table.

Because the gage head now serves only to measure deviations, it can be moved easily from point to point without losing the reference axis or any accuracy. As a result, it is possible to make these measurements to an accuracy of 3 millionths or less in a few minutes:

Roundness	— any inside or outside diameter
Concentricity	— any ID or OD to any other ID or OD or axis
Alignment	— any axis to another axis
Flatness	— of any face
Squareness	— any face to any axis

For those not familiar with the interpretation of the charts, it should be explained that a transparent over-

Fig. 22—In contrast to the Talyrond, the Cleveland "Indi-Ron" instrument rotates the workpiece, while it is being checked for out-of-round, concentricity and squareness

"and must be round within..."

lay with a number of calibrated concentric circles is placed over the chart. Deviations from roundness and the centers of the recorded circumferences are then easily measured. Interpretation of the charts involves only the change in radius of the plotted circumference and the location of the center of the plot.

The Indi-Ron permits rapid identification of the amount and type of roundness or concentricity error, so that the machine producing the part can be adjusted to correct this error. In many cases it is as easy to produce good parts as rejects simply by learning how to adjust the production machine using the Indi-Ron charts as guides. An air-conditioned room is not required for use of the instrument, only an area free from drafts and with temperature changes about 5° F per hr or less.

Also as a result of this type of check, companies are finding that noise, vibration, failures, etc, that they were trying to correct by improving surface finish, use of more refined machinery, etc, was really due to out-of-round conditions not detectable by V-blocks, diametrical checks, and other methods of out-of-roundness measurements.

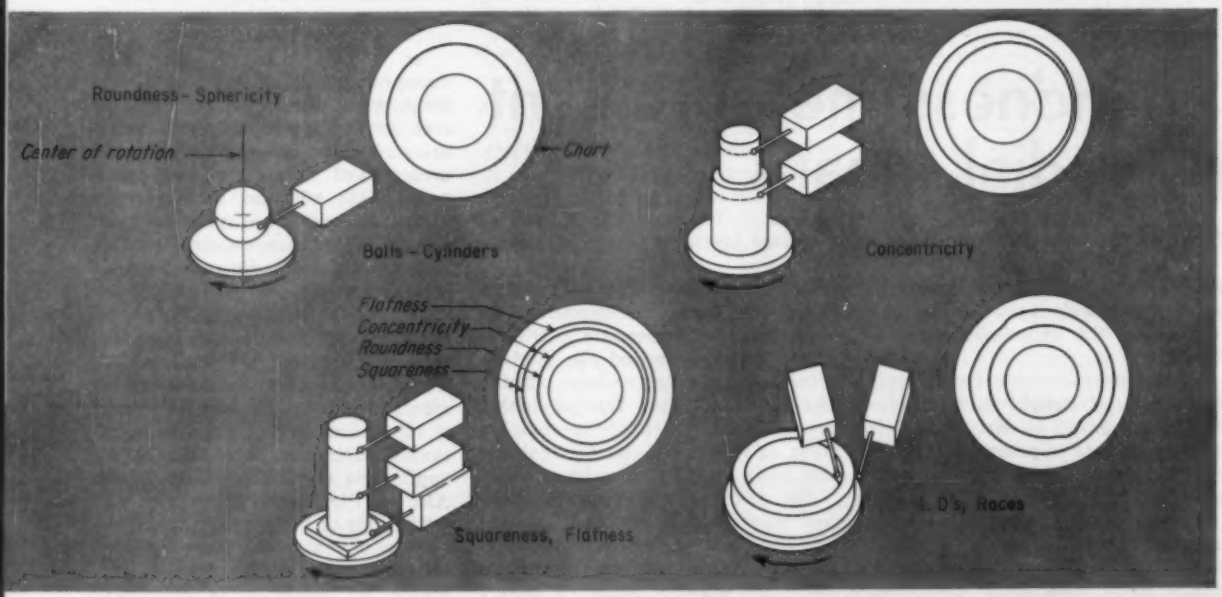
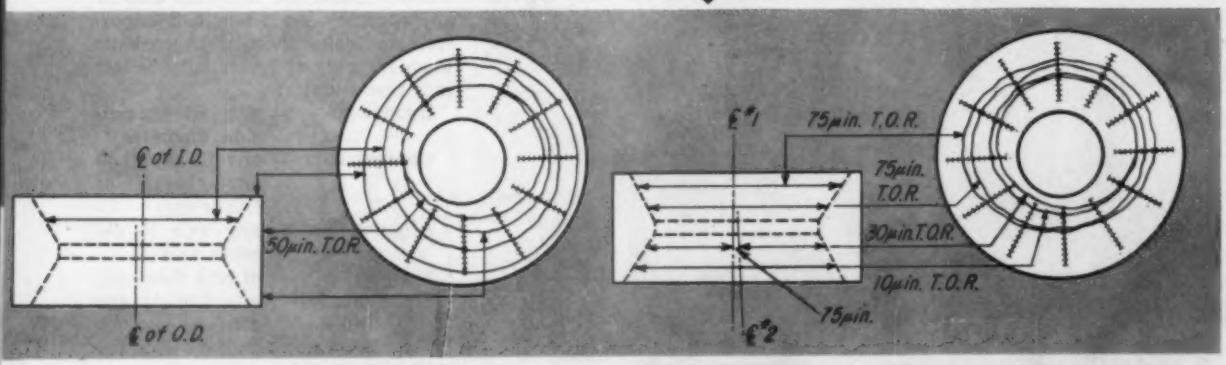


Fig. 23—Several gage heads can be applied simultaneously on the "Indi-Ron" to measure several diameters, faces, flanges, etc., for out-of-round, concentricity and squareness. Two gages can be connected differentially to plot only the resultant eccentricity between two diameters

Typical measurements on bearing races, as performed on "Indi-Ron" instrument: Fig. 24—concentricity of upper cone to OD; Fig. 25—roundness—upper and lower cones; concentricity —upper and lower cones



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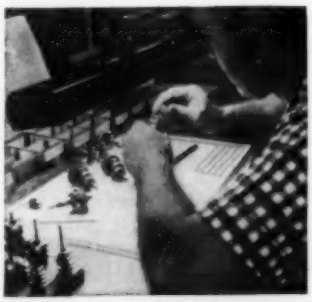

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Tests for Straight Cutting Oils – I

By Alan B Myler, chief engineer, Metalworking Oil Dept, SUN OIL CO, PHILADELPHIA

Straight cutting oils can be evaluated with a group of tests which can be readily performed with relatively simple laboratory equipment. See similar tests on soluble oils (*AM*—June 2, '58).

Viscosity Tests

In reviewing the important characteristics of straight or non-emulsifying cutting oils, viscosity is probably the first thing to consider. In this country, viscosity is expressed in seconds at 100 F, as measured by a Saybolt Universal Viscosimeter. This is the time it takes 60 ml. of oil to flow through a Universal orifice under specified conditions.

The practical viscosity range of straight cutting oils is from 50 to 250 sec. In general, the viscosity of a cutting oil should vary *inversely* with the speed of the machining operation; that is, the faster the cutting speed, the lower the viscosity should be. Thus, aluminum and brass, which are usually cut at high speeds, require a low viscosity oil, usually in the 60-120 sec viscosity range.

General-purpose cutting oils for steel usually are in the 120-160 sec viscosity range. This range covers the multitude of turret lathe, milling machine, and automatic-screw machine operations.

As cutting operations become more difficult because of higher alloyed steels, machining speeds become slower. This situation allows use of more heavily compounded cutting oils with higher viscosities. The usual viscosity range for these heavy-duty oils is from 160 to 225 sec.

Flash and Fire Tests

Flash and fire points of straight cutting oils are important because they tell you how much of a fire hazard you are working with. These temperatures are measured on a Cleveland open-cup tester and are expressed in degrees Fahrenheit. The flash point of straight cutting oils is usually in the 270 to 350 F range. If lower than that, it probably indicates the presence of kerosene or volatile solvents. These inclusions are usually unnecessary and not desirable. Oils

Fig. 1—Saybolt universal viscosimeter

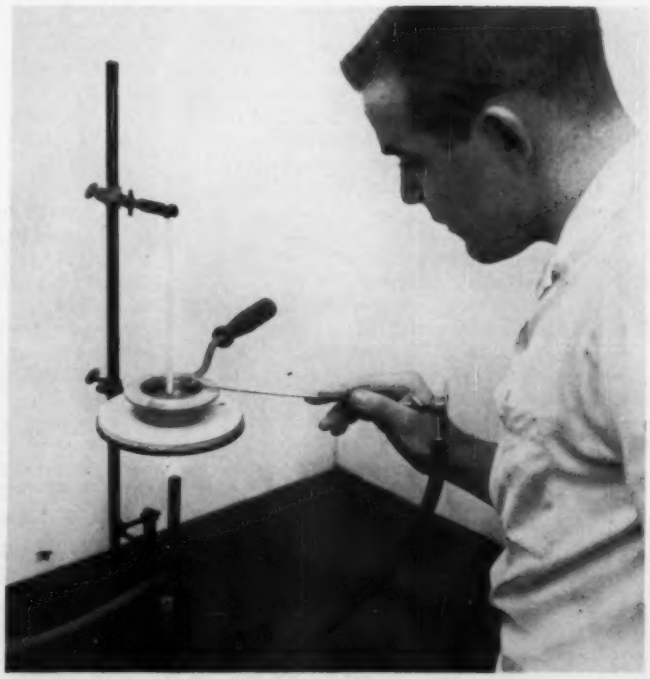

Fig. 2—Cleveland open-cup tester for determining flash point of oils

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Tests for Straight Cutting Oils – II

with flash points on the high side of the range may be more desirable for applications where oil fog or mist is a shop problem.

Color

The color of a cutting oil may or may not be of practical importance. Many black cutting oils give satisfactory results, particularly on heavy-duty work. On the other hand, many machining operations can be more efficiently done with clear transparent oils. In some cases, the workpiece must be visible to the operator while the machining operation is in progress. In general, operators prefer transparent oils.

Cutting oils are rarely specified to a definite ASTM color scale as are lubricating oils. They are usually specified simply as light transparent, dark transparent, or black. Any oil with a color up to an ASTM No. 6 color could certainly be classified as a light-colored oil. Oils with colors above that and through the entire ASTM dilute color scale would be classified as dark transparent oils.

Sulfur Tests

Sulfur is the most important compounding agent used in straight cutting oils. It increases the film strength of the oil and gives it anti-weld properties. The accepted theory is that there is a chemical reaction between the sulfur and the chip which forms a film of iron sulfide. This film acts as a non-fluid lubricant which allows the chip to slide over the face of the tool more easily, reducing frictional heat and reducing the tendency to weld to the tool.

The bomb sulfur test method has been used for many years to determine the amount of sulfur in cutting oils. Briefly, a weighed sample of cutting oil is put into a bomb, the bomb is charged with oxygen, and electrically fired or ignited. All the sulfur in the oil burns to form a sulfate. The bomb is carefully washed out and the sulfate is precipitated and weighed. This method determines the total *sulfur* in the oil.

However, sulfur is present in cutting oils in at least two forms, designated as active and inactive

Fig. 3—Bomb for determining sulfur in cutting oils

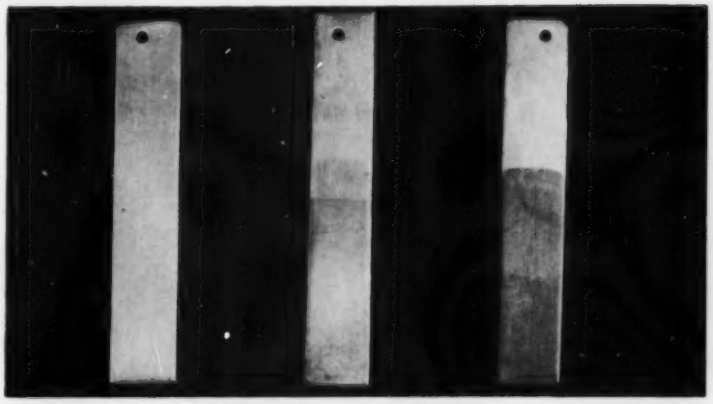

Fig. 4—Copper strip test for sulfur in cutting oils

sulfur. Active sulfur in a cutting oil is measured by its reaction to copper at 300 F. In this test, finely divided copper powder is reacted with the sulfur in the cutting oil at 300 F. The excess of copper powder and the insoluble copper sulfide formed are removed from the oil by filtration. Then bomb sulfur determinations before and after reacting with the copper powder are made. Active sulfur, or the amount which reacted with the copper powder, is determined by the difference.

Copper Strip Test

The copper strip test is a qualitative test to determine the presence of active sulfur in a cutting oil. A clean polished copper strip is immersed in the oil to be tested. Most active sulfur oils will turn the copper strip black immediately at room temperature. If this does not happen, the oil with the copper strip immersed in it is heated to 212 F and held there for 3 hr. The color developed on the copper is compared to a standard ASTM color chart. When petroleum oils are sulfurized, the resulting sulfurized mineral oil contains active sulfur which will discolor copper. For that reason, they should not be used for machining copper or copper alloys, if a stain is objectionable. They also are rarely used as machine lubricants because of discoloration and possible damage to copper oil lines and bronze bearings, but are the type oils usually used for machining steel.

When a fatty oil, such as lard oil or sperm oil, is sulfurized, the

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Tests for Straight Cutting Oils – III

resulting sulfurized fatty oil is usually stainless to copper. Stainless sulfurized cutting oils are made by blending these sulfurized fatty oil bases into a petroleum lubricating oil. The sulfurized fatty oil is considered to be an "oiliness additive" and extreme pressure agent. Stainless sulfurized cutting oils are used as dual-purpose lubricating and cutting oils on automatic bar and chucking machines, and also for machining copper and brass where a stain is not desirable.

Natural sulfur is normally present in petroleum lubricating oils in quantities of 0.1% to 0.5%. In a few oils, this way be as high as 2%. However, natural sulfur is considered to be inert chemically and of no value in cutting operations. The usual sulfur range of cutting oils is as follows:

Transparent sulfurized mineral oils—up to 1.0% added active sulfur.

Black sulfurized mineral oils—up to 2.5% added active sulfur.

Stainless sulfurized fatty mineral oils—0.5 to 2.0% added *inactive* sulfur.

Chlorine

Chlorine, like sulfur, is incorporated in cutting oils to increase their film strength and anti-weld properties. It is used in cutting oils to supplement sulfur and is rarely used alone. The accepted theory is that a film of iron chloride is formed at a lower temperature than the film of iron sulfide. Therefore, chlorine is an additive valuable for machining operations performed at relatively low temperatures such as threading, tapping and broaching. The amount of chlorine found in cutting oils is usually in the 0.5% to 2.0% range, although for specialized applications it may run as high as 10%. Chlorine does not discolor copper or steel. A *high* chlorine content in cutting oils is a potential source of trouble in that it may react with moisture on humid days, forming a mild chlorine acid, which will rust the machine and parts.

Fatty Oils

Fatty oils are used in cutting oils because they are wetting and oiliness agents and, in their sulfurized form, are extreme-pressure additives. These properties of fatty oils enable machine operators to use higher speeds and get better finishes in many cases.

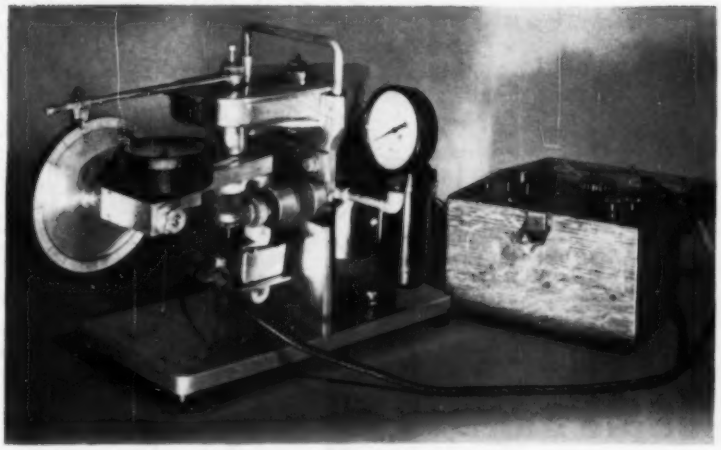


Fig. 5—Falex extreme-pressure testing equipment

Lard oil and sperm oil are the two fatty oils most commonly used. They are usually put in cutting oils in concentrations of 2% to 10%. For special applications, such as form grinding, this may be increased to 25%.

The analysis to determine the quantity of fatty oil in a cutting oil in the presence of sulfur is not easy. There is no standard ASTM test for this analysis, but the General Motors Laboratories have developed a method which is accurate, but long and tedious.

Extreme-Pressure Tests

Extreme-pressure tests cannot be used to evaluate the quality of a cutting oil. Very small quantities of some extreme-pressure additives will impart a high film strength to the oil, but they will not make it a good cutting oil. Film strength alone is not enough. A cutting oil must also have good cooling properties, and be a good lubricant and anti-weld agent.

Extreme-pressure tests are excellent quality control tests for checking the properties of a specific oil, either from a manufacturing or usage standpoint. It is a measure of the degree of heavy-duty work an oil is capable of doing, but it must be correlated with the amount of fatty oil, sulphur and chlorine in the oil before it can be properly appraised.

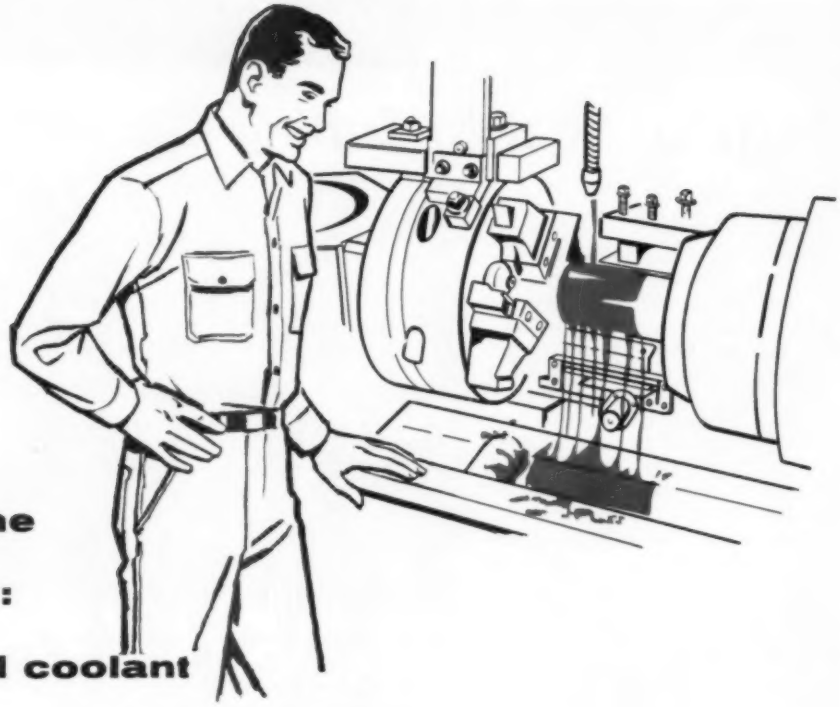
There are a number of machines in general use for determining the film strength, or extreme-pressure properties, of cutting oils. The ones commonly used are Timken, Falex, SAE, Shell 4 Ball, and Almen machines.

IMPORTANT PROPERTIES OF STRAIGHT CUTTING OILS

Property	Test Method
Viscosity, SUS/100F	ASTM D88 or D445
Flash Point, °F, COC	ASTM D92
Fire Point, °F, COC	ASTM D92
Color	ASTM D155 Revised
Total Sulfur, %	ASTM D129
Active Sulfur, %	ASTM Tentative*
Copper Strip Test	ASTM D130
Chlorine, %	ASTM D808
Fat Content, %	GM**
Extreme Pressure Tests	Commercial EP Tests

* See page 951 of 1956 ASTM D-2 Manual

** General Motors Standards, Methods of Testing Lubricants, Vol. II, P. U-63, April, 1942, "Total Saponifiable Matter in Oils Containing Added Sulfur."



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Detective Story

BREAKING BREAD recently with a group of the commercial heat treaters led us to appreciate what Horace Knerr calls the problem of tracking down mysterious failures in heat treating. When the detective work starts, he says, the heat treater is particularly vulnerable because he is the fellow last seen with the victim alive. Knerr recalled the time a major lamp manufacturer suddenly found it couldn't make filaments any more. There were at least a hundred operations involved and the result was a filament with a small grain size when a coarse grain size is essential. (That's right, the coarse grain has less tendency to sag.) They checked every operation carefully, but nothing was changed from the days when they had been able to make good filaments. Finally they found one thing changed: The man who moved the tungsten ore from the bins to the sintering shop had a new wheelbarrow. The old barrow was wood, the new one metal. Just enough contamination to ruin the filaments.

Steel Uniformity

WHEN THE METAL TREATING INSTITUTE met recently, one of the members shed some light on the variation in hardenability of steel. Charles F Lewis, of the Cook Heat Treating Co of Texas, is a man whose hobby is statistics and he has applied it recently to a study of the variations to be expected in AISI 4142 steel. He selected 15 heats from each of five steel suppliers for study. A third of the bars were under 2 in., a third were 2 to 5 in., and the rest were over 5 in. He found no heat that did not fall within the hardenability bands, but that was about the end of the good news. One supplier evidently works toward the high side of the band, one to the low side, and three aim for the middle. Heat treaters would like to see the low hardenability in the small rounds and high hardenability in the large rounds. Actually it was the reverse.

Statistically, 90% of the samples fell within ±18% of the average value. According to Lewis, if all suppliers would concentrate on the same target, this could be reduced to 12%. If suppliers could roll sizes on the basis of hardenability, it could be reduced to 5%. Well, we can dream, anyway.

Definition

A HIGH-BROW is a man educated beyond his intelligence.

Vacuum Treating

DOING YOUR HEAT TREATING in a vacuum can do wonders in special cases, but it creates problems in more than heat transfer. R C Gross of Kinetics Corp tells the story of a job furnished all mounted in tempering fixtures. Suddenly the furnace wouldn't work any more and the culprit turned out to be four brass screws in the fixture. Copper starts to evaporate at 800 F in a vacuum and the result was zinc crystals floating around and settling on the valve seats of the furnace controls.

MEMOS

by BESS RITTER

America isn't the birthplace of the automobile, although this is casually considered by many to be the case. For several decades prior to 1890, German and French inventors were busy experimenting with engines that burned illuminating gas, vaporized oil, and finally vaporized gasoline. True, they were heavy and slow at first and revolved approximately 150 times a minute. But by the 1880's Daimler came up with a machine that went as fast as 800 rpm. He installed it in a carriage by 1886.

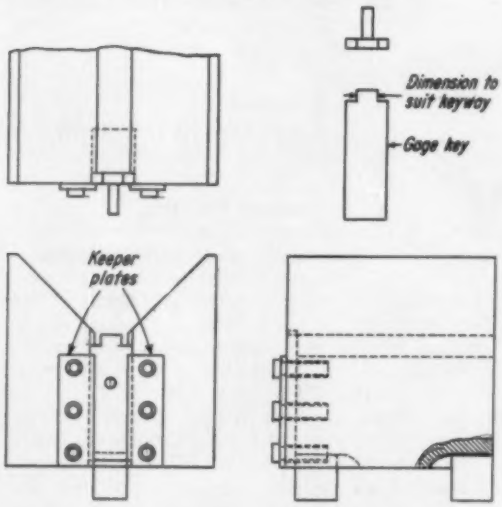
By 1892 Levassor — a Frenchman — designed a machine in Paris that bore a closer similarity to today's automobile. At least, it had an engine in the front that was properly concealed underneath a hood. It was also equipped with a sliding gear transmission and a clutch. These carried the power to the wheels in the rear.

By the time 1895 rolled around—when Americans, by the way, were still fooling around with do-it-yourself gas built buggy machines—the European machinist was happily employed at manufacturing sleek, bona fide cars, which were used in the running of competitive road races. Well-to-do Americans were very happy to import them and drive them in the States in preference to any domestic model.

To top everything else, the very name "automobile" isn't American. It was coined overseas by the people of France.

Practical Ideas...

V-Block Indexes Work



Standard indexing equipment cannot handle all indexing jobs. An example of this is when two keyways, facing each other 180° apart, must be milled in a fairly long and large-diameter shaft. Here precision V-blocks are necessary to hold the shaft during machining. But after one keyway is milled, accurate indexing is a definite problem.

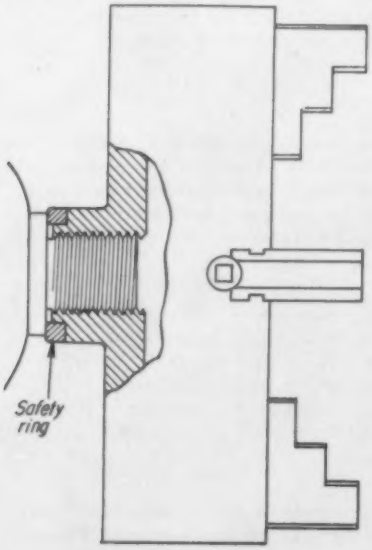
The illustrated V-block shows how we reduced this type of indexing to its simplest form. After indicating the block to place the apex of the V on center with the cutter, the shaft is strapped in place and one keyway is completed. The straps are then loosened and the shaft rotated so the sliding gage key can be inserted in the keyway. The straps are retightened and the second keyway milled. If this cycle is completed without disturbing any of the head or table-traverse settings, a pair or keyways perfectly spaced will result.

These V-blocks are constructed in the same manner, and with the same care, as other precision V-blocks. The only deviations are a wider relief, accurately centered in the apex, and a slot to receive a gage key. Two keeper plates, secured by 6 capscrews, provide a slide-fit channel for the gage key.

G D Marshall, Newton, Iowa

Safety Ring for Chuck Adapter

A number of our lathes employ the threaded spindle and adapter arrangement. All too often chucks are, either by accident or carelessness, jammed onto the spindle so tightly that drastic measures have to be taken to remove them. In some instances the chuck would be so hopelessly jammed that it had to be disconnected from the adapter or back plate, which then had to be machined into chips and destroyed.



This problem has since been eliminated. All back plates have now been equipped with a safety ring which can be plunge cut with a cut-off tool to relieve pressure. The back plate is then easily unscrewed and the remainder of the ring removed after which a new ring is installed.

The sketch shows how the ring is fitted to the back plate. After the concentric step has been machined, a steel ring is either pressed or shrunk in place. The face of the back plate is then placed on the surface-grinder chuck and the ring is cleaned up to insure parallelism.

E. Jones, Bronx, NY

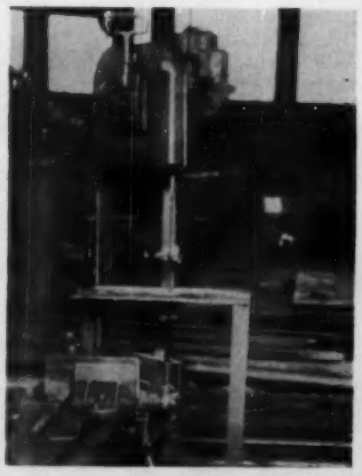
Stock Cut-Off Saw Converts To Vertical Bandsaw

Even though we have a regular metal-cutting bandsaw, it sometimes happens that it will be tied up for long periods of time. To overcome this block, and to allow us to do simple bandsaw work, we equipped our horizontal stock saw with a table. In a matter of minutes, this saw can be raised to vertical position, fitted with the table, and be ready for use.

Once the saw frame has been raised, by disconnecting the hydraulic cylinder and removing the bolt which limits the elevation of the frame, a stand supports it in a vertical position. Belt tension is maintained on the motor pulley with a hold-back bolt.

The table is a ⅜ in. thick, 24 in. square C R S plate with one channel-iron leg to the floor and one angle-iron leg to the saw bed. A flat bar clamp holds the table to the saw frame. The limited throat capacity is overcome by twisting the blade with 90° bar brackets on the blade guides.

John Meldrum, fabricating foreman, Steel Fabricators and Machine Works, East Boston, Mass



Lock-Up Die Forms Flange

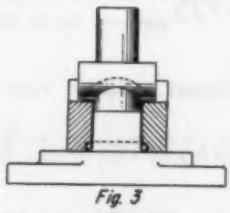


Fig. 3

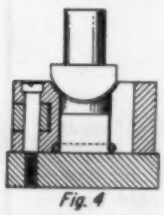


Fig. 4

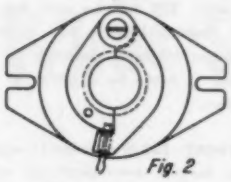


Fig. 2

Fig. 1

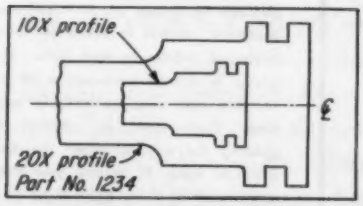
We had to design a die that would produce a flange on a sheet metal part with one stroke of the press. The problem facing us was that this operation was the last of a series of stops to complete the part. It had previously been blanked, rolled, seam soldered, and edge rolled.

Because of the rolled edge, a simple slip-loading die was eliminated. The only way the part could be inserted would be through the bottom or from the side of the die. Side loading was the answer, and the sketch shows how the lock-up die we constructed solved the problem.

Fig. 1 illustrates front and side views of the finished part. This part is, incidentally, a hopper; its flange later to be soldered to the top of a household almond shredder. The top view of the die, Fig. 2, shows how the forming section of the die is split. The right side of the die is stationary while the left swings open, hinged on a specially machined hingebolt. A pin inserted in the top of this half serves as a handle to open the die and a spring-loaded plunger locks the two halves together.

Side view and end view of the punch, as well as sectionals of the die, are shown in Fig. 3 and Fig. 4. The close fitting pilot of the punch supports the sides near the flange and prevents their collapsing.

Hjalmar Dahl, Upplands Vasby, Sweden



Comparator Charts Save Time

For a quick optical-comparator check of work profiles, many lens changes can be eliminated if dual charts of the most common magnification are used. We have standardized our comparator inspection to employ either ten or twenty power magnification. Where a great deal of work is checked on a single comparator, this technique makes it possible to check a part regardless of which of the two lens systems is mounted in the unit.

The above sketch shows a typical dual chart of the same part. The smaller of the two is the profile of the part under ten power magnification. The larger is the image of twenty power projection. Naturally, the greatest accuracy of comparison measurement is obtained with the highest magnification system. But for a large share of the work, the lower system is acceptable.

When dual charts have been made of all parts to be checked, focusing is the only adjustment necessary. This adjustment requires but a few seconds to make, while several minutes would be necessary to change the optics which are, at the same time, subjected to wear and damage.

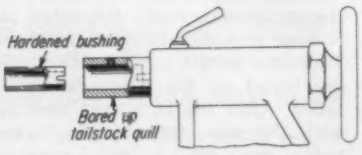
Fred Buehler, instructor mechanical dept, Rochester Institute of Technology, Rochester, N Y

Sleeve Saves Tailstock Quill

The tapered bore in a tailstock quill takes a lot of abuse when a poorly fitted shank of a drill or reamer is used in the tailstock. Very little force will then be necessary to cause the tool shank to rotate in the quill bore with the inevitable result in damage to both shank and quill through galling.

This problem could be eliminated were it possible to employ a slot in which to seat the tang of the tools. But, because the feed screw is also the tool ejector, this idea could not be applied. The only answer seemed to be a hardened bore that would not mar or cause galling. The question then remained—How do you go about getting a hardened bore without creating a major operation? This is the way we did it.

After chucking and indicating the tailstock quill in the lathe, we bored it up to accept a standard turret-lathe toolholder sleeve. These



sleeves, obtained from industrial equipment dealers, are hardened and ground. We chose the open-back-end type so the ejector screw could operate as designed. A flat landing was ground on the sleeve to coincide with a tapped hole through the quill. The sleeve was then pressed into the quill and locked with a setscrew to prevent its pulling out during tool ejection.

R G Cavaiani, Iron Mountain, Mich

Draftsmen's Dividers Do a Better Job of Layout

When a little extra pressure is necessary to scribe a circle, the legs of ordinary toolmaker's dividers distort and accuracy is lost. This tendency towards spiralling is particularly annoying in small diameter layout.

For better results, I use the more rigidly constructed draftsmen's dividers. The only alteration needed is a scriber point of a suitable-diameter hardened drill rod in place of the pencil lead.

Walter Gerstel, Berkeley, Calif

Practical Ideas...

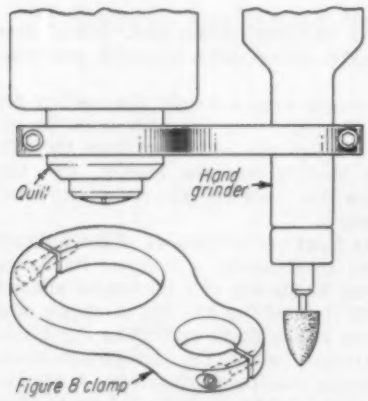


Figure 8 clamp

Clamp Permits Jig Grinding

The above sketch shows an easily made figure-8 clamp we use for mounting a hand grinder on the quill of a vertical miller. When fitted with abrasive wheels, carbide cutters, or burrs, the grinder enables us to perform accurate jig-grinding operations in the milling machine.

Except for the bored holes and the clamping-screw holes, the entire job is done in a metal-cutting bandsaw. To insure parallelism, the two holes are bored on the faceplate in the lathe. After the slits have been cut with the saw, the clamping screw holes are tap drilled, clearance drilled, and counterbored. The material used should be no lighter than ⅝ in. or the clamping surfaces in the bores may be too narrow.

Howard Levy, Brooklyn, N Y

Knurling Tool Burnishes

When rod surfaces require better than a ground finish, burnishing tools are usually employed. This is a process by which minute imperfections are flattened out with a roller exerting pressure on the surface. A polished finish is thus produced without removing metal.

A perfect burnishing tool can be made by replacing the serrated rollers in a knurling tool with small ball bearings. If the ID of the inner race is too large for the mounting pins bushings should be used.

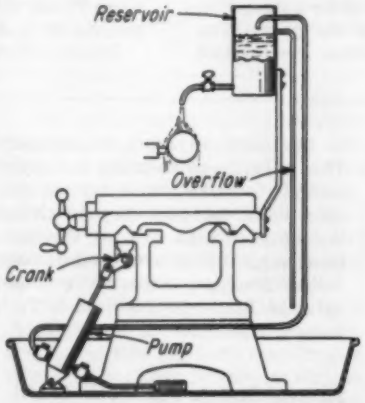
The tool is clamped in the tool post as when used for knurling and traversed by power feed over the rotating surface.

Jesús Petit-Jean, Monterrey NL, Mexico

Feedscrew Drives Coolant Pump

While doing a job in a lathe of some age, I found it necessary to supply the workpiece with a constant flow of coolant. I therefore rigged up a reservoir, complete with spout and control valve, on a bracket fastened to the carriage. This worked fine for a while until I got tired of bailing the chip pan to fill the reservoir.

This being the age of automation, I decided to do something to eliminate the bucket operation. I constructed a simple cylinder pump from brass tubing with a plunger of back-to-back leather cups. The cylinder has an outlet and an inlet at the bottom end, each equipped with a small check valve.



A pad with a trunnion pin anchors the cylinder to the bottom of the chip pan, allowing the cylinder to rock forth and back. To the inlet valve is connected a short length of neoprene hose ending in a screen on the bottom of the chip pan. Another hose couples the outlet valve to the reservoir. An overflow line from the reservoir returns excess coolant to the chip pan.

Power takeoff from the lathe feedscrew is accomplished with a crank mechanism. This can be either a straight crank arm, as shown, or a round disk with an eccentric crank pin. Whichever design is used, the throw needs only be a short one.

William Martin, Brooklyn, N Y

J P ESSEX
Sussex, England

won $25 in addition to regular payment for his idea:

ECONOMY FORMING TOOL

in the Sept 8, 1958 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

PAYMENT—$25 in addition to regular rates for the items published to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N. Y.

In financial aid to education...

What Should Business Do Now?

Now that the federal government is entering the field, should business firms stop giving financial aid to our colleges and universities?

This question is now being discussed by business directors throughout the country. The discussion is prompted by the near-billion-dollar program of federal aid to education passed by Congress a few months ago. For if the federal government, with its access to billions in taxes, is assuming responsibility for the financial welfare of education, should not business get out of the way and let the government take over? This is the general way the question is being asked.

The answer is a resounding NO.

What The Federal Program Does

The new federal program makes it possible for the government to spend the imposing total of $900 million for aid to education over the next four years. There are still many loose ends in the program. But already it's quite clear what such funds will — and will not — do to help relieve the financial plight of our colleges and universities.

First of all, the program is not going to solve any financial problems in education overnight. The program is just barely underway. So far no money has actually been allocated, and Congress has appropriated only $40 million — less than 5% of the total.

More important, there is very little in the total program which will result in direct aid to colleges and universities. The program does set up fellowships to train college teachers. But most of the aid will eventually be channeled through the states to primary and secondary schools. The main focus of the program is education for national defense — strengthening science, mathematics and foreign languages in elementary and secondary schools, together with grants for counseling, testing and research.

The one big item for higher education is a $295 million student loan program, which will help needy students pay tuition and other fees. But tuition rarely covers the full cost to the college of educating a student. So the net result could well be an additional financial strain on our institutions of higher learning.

For the three most pressing financial needs — faculty salaries, scholarship grants and new plant and equipment—colleges and universities must still rely heavily on help from the business community. And it would indeed be a major

misfortune if the recent actions of the government put a blight on this growing and substantial support to higher education.

In the last ten years, business has expanded its financial aid to education by more than four fold. In 1948, contributions were only $24 million. In 1957, such aid reached an estimated $125 million. Moreover, corporations have been putting a larger proportion of their total charitable gifts into education. In 1950, the percentage was only 17%. By pre-Sputnik 1956, the share had already increased to 34%, according to figures recently released by the Council for Financial Aid to Education.

Why Business Must Help

The most compelling reason for increasing business aid to higher education — at an even faster rate—is that our colleges and universities desperately need financial help. It is that simple. Private contributions to higher education must average at least $400 million over the next ten years if our colleges are to meet rising operating costs and raise faculty salaries to decent levels. Despite the growth in business contributions, we are still well below that goal.

If our colleges cannot solve their mounting financial difficulties through voluntary help from business firms, alumni and communities — then it is to be expected that federal aid ultimately will be mobilized in a big way. In principle, if not in dollars, the 85th Congress has paved the way. Indeed, a large federal scholarship program was squeezed out of this year's legislation only in the course of last-minute compromises. And Arthur S. Flemming, Secretary of Health, Education and Welfare, has urged that the next session of Congress restore the scholarship program.

About any federal rescue operation for higher education, two things are quite clear:

(1) **Such aid will come too late to prevent irreparable harm resulting from the current shortage of funds.** The need for help is urgent and immediate.

(2) **With federal taxes taking over half of all corporate income, any federal program in the end will be financed in large part by the business community.**

An Opportunity

So, viewed narrowly, it is in the selfish interest of business firms to aid our colleges and universities now, rather than wait and be forced to pay later on. By doing so, they ensure that business will have a continuing supply of well-trained graduates. They take advantage of the tax laws for charitable contributions which mean the government in effect assumes more than half the cost of business aid to education. And they win gratitude for a voluntary and generous act.

Viewed in the broad public interest, the business community has an opportunity to perform a financial rescue mission in education which could well be the key to successful survival, not only of our present system of higher education, but also of the nation itself.

As previous editorials in this series have pointed out, a very small share of the net income of business firms — about 1% — would do the job. Certainly business must not be distracted from this opportunity by the new venture of the federal government in financial aid to education.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nation-wide developments. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw

PRESIDENT

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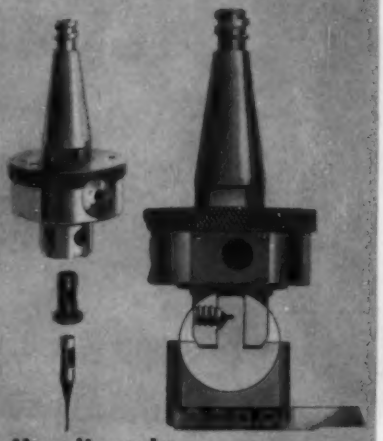
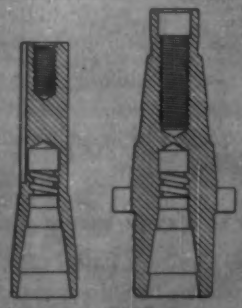
Packaged Set
includes boring chuck, reducer bushing, extension bar and tool bits.



How it works

Holes from 5/32"... Note 1/2"–3/8" reducer bushing for either 1/2" or 3/8" shank holes.

To 5" holes... Here 1/2" shank is merely a drawback to use nose end of chuck for stiffness.



Bridgeport Millers
can utilize Moore Boring Chuck Set by means of shank adapter at left. Another Moore adapter (right) fits machine spindles with No. 40 tapers.

One Moore Boring Chuck Set bores any hole from 5/32" to 5"

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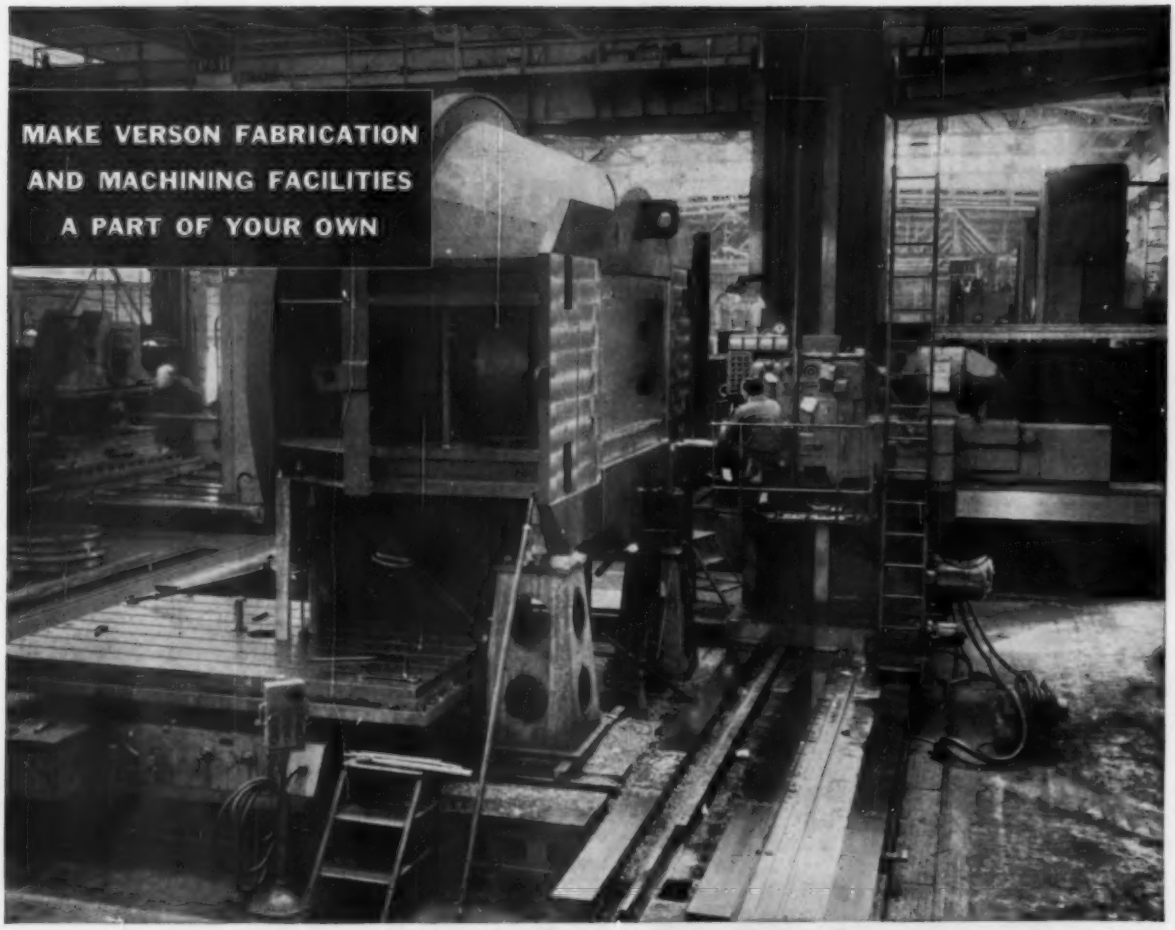

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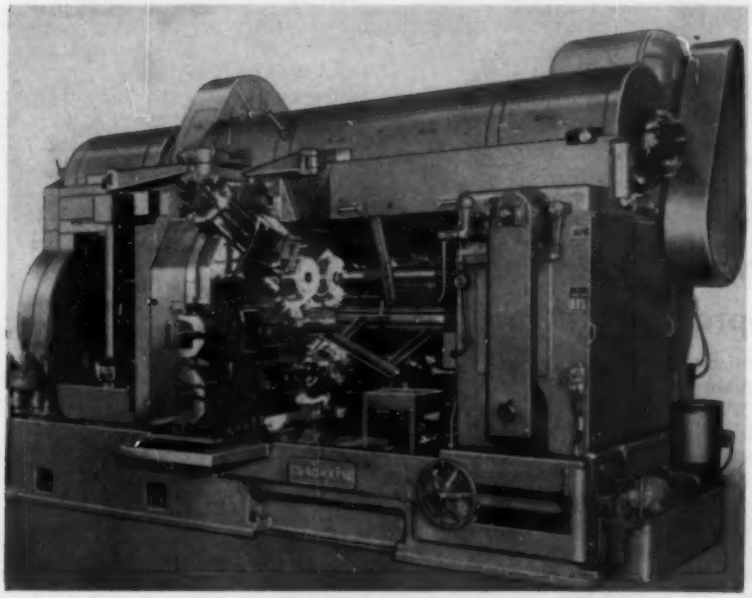


6-in. Six-Spindle Conomatic Provides Spindle Speeds of 33.9 to 390 rpm

Model TN, newest and largest in the Conomatic line, is a 6-in. six-spindle machine designed to handle a wide range of screw machine work. The maximum load of stock—six 6-in.-dia bars twelve feet long—would weigh 6921 lb. The machine itself weighs about 80,000 lb.

Idle time is 5.6 seconds. The carrier is indexed by a sprocket chain drive. Because of the loads involved, the base and top bed extend beyond the carrier to support the first stock reel disk, which is also indexed by chain from a sprocket on the extended indexing shaft.

Both stock feed and collet closing are operated by drumshaft cams, but each is provided with an air assist which shares the load with cam mechanism. These air cylinders may also be used to open and close the collet and to feed stock when the machine is stationary. Because of the great weight the pusher tubes must carry, the outboard end of each tube runs in a double Timken bearing. This bearing is mounted in an individual bracket sliding in gibs on the member which joins the carrier and the first stock reel disk.

The carrier indexes counter-clockwise and the spindles rotate counter-clockwise (when viewed from the right end column). Normal cutoff is in the 6th position and the machine feeds stock after index in the 1st position.

The 2nd and 3rd cross-slide positions are in a single slide. The 4th, 5th, 6th and 1st are in independent slides. All slides move horizontally except the 5th slide which is tilted 30° from the horizontal. The diameter of the main end slide is 17 in.

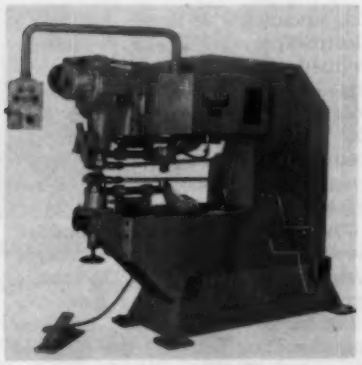
Three cam drums are provided for auxiliary spindles and one for a universal slide.

Other features include an electrically operated reverse clutch; independent motors for the coolant pump and lubricating oil pump; and an electric interlock which prevents machine from starting until the lubricating pump has built up pressure.

Specifications include spindle speeds of 33.9 to 390 rpm; work revolutions per cycle from 846 to 44; normal power of 75 to 125 hp at 1800 rpm. Over-all dimensions of the machine: Length, with stock reel, 257¼ in. (216¼ in., without reel); width, 111½ in.; height over covers, motor dismounted, 128 11/16 inches.

Cone Automatic Machine Co, Inc, Windsor, Vt

MORE DATA? Circle 51, inside back cover



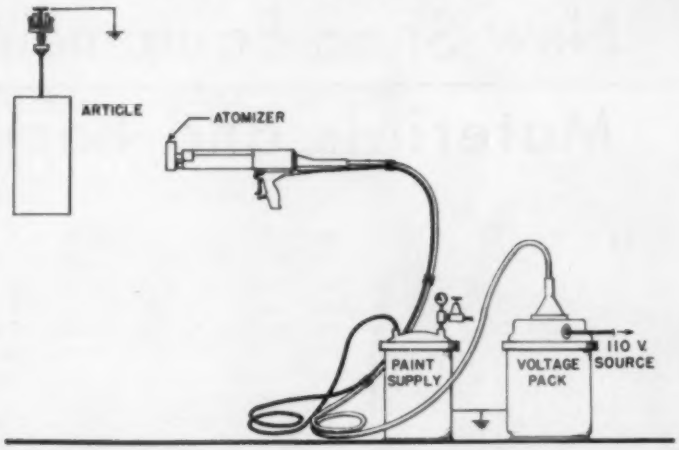
Shearing and Forming Machine is Largest in Pullmax Line

The Model U-10, largest in the Pullmax line of shearing and forming machines, has an edge cutting capacity of 13/32-in. mild steel. Because this new model features automatic raising and lowering of the upper tool, the operator has both hands free for inserting the material. Speed can be adjusted within the range 350-1800 strokes per min. Ten different stroke lengths are available, ranging from 0.001 to 0.375 inch.

The machine can be fitted with a heavy-duty, pneumatic circle cutting attachment and a quick-locking straight cutting attachment. Box-frame construction is featured; the entire mechanism operates in an oil bath. All the standard tools used with the other Pullmax machines can be used with the Model U-10.

American Pullmax Co, Inc, 2455 N Sheffield Ave, Chicago 14, Ill

MORE DATA? Circle 52, inside back cover



Ransburg Develops Portable Hand Gun For Electrostatic Paint Spraying

The advantages of Ransburg's No. 2 Electro-Spray Process—heretofore available only in automatic, conveyorized units—have now been incorporated in an electrostatic hand gun. The gun consists of a No. 2 Process atomizing bell built into a lightweight unit designed for manual operation.

The piece to be coated is grounded electrically through its conveyor hanger or other support. A voltage pack is connected to the gun, creating an electrostatic field between the atomizing bell and the piece to be coated. Coating material is supplied to the atomizer by either pump unit or pressure tank; rotation of the bell feeds liquid to its outer edge. Atomization occurs under the influence of the electrostatic field, producing a spray pattern of electrically charged particles. Electrostatic attraction pulls the spray to the article, and essentialy all of the spray is deposited on the article. No compressed air is used for atomization.

In many cases, the hand gun has a painting rate equivalent to a conventional air spray gun. It is considerably faster on certain items, such as those fabricated from expanded or perforated metals, tubing, rod, and wire. This is because of the "wrap-around" nature of electrostatic spray, which paints all sides of such items from one side only.

Users have reported two to six times as many parts per gallon as with conventional air spray guns; production increases up to 200% with no additional labor; up to 75% reduction in spray booth maintenance cost; less air make-up for the finishing department; and higher quality of finish.

Almost any metal article, and many non-metallic articles, can be painted with this equipment. Power required is about 50 watts from a conventional 110-v supply. Except for a few materials of relatively high electrical conductivity, most types of industrial coating materials can be used successfully.

Ransburg Electro-Coating Corp, 3939 W 56th St, PO Box 7822, Indianapolis 23, Ind

MORE DATA? Circle 53, inside back cover

Portable Vacuum Cleaner Removes Magnesium Grinding Dust

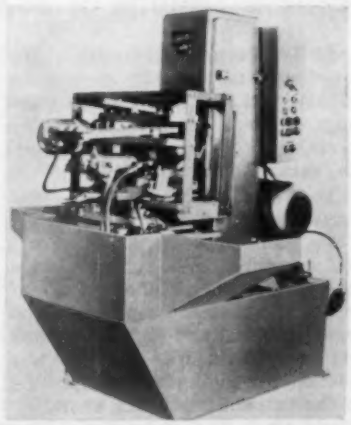
The Wetco-Vac portable vacuum cleaner is designed for general plant cleanup work but has proved especially valuable in the safe removal of magnesium grinding dust. The dust is picked up and conveyed to the machine's wet-type separator section. The separator uses water for a wetting agent and has a capacity of 50 gallons. Air and entrained materials pass between a series of baffles located above and below the water line. The resultant action causes a violent mixing of the air, entrained material, and water, insuring thorough wetting of the collected material and serving to keep the dust well below the flash point.

The non-soluble portion of the material settles to the bottom of the tank in the form of sludge and is removed periodically. The water is separated from the cleaned air in the top portion of the separator as the air moves slowly upward to the discharge outlet.

The separator is equipped with a 16-in., gravity-closing, combination explosion release and inspection door; an 8-in. inspection door; a port hole door and two explosion release vents. The vacuum cleaning unit is 74 in. long, 83½ in. high and 39 in. wide. Using a 5-hp motor, it develops a suction of 6.5 in. Hg and has the capacity to operate two 1½-in. cleaning hoses. Hoses can be 25, 50 or 75 ft in length.

U S Hoffman Machinery Corp, Air Appliance Div, 103 Fourth Ave, New York 3, NY

MORE DATA? Circle 54, inside back cover



AUTOMATIC ROTOR GRINDER, Model BG8/HT, is an abrasive belt machine designed to grind rotors to diameter tolerance of ±0.001 in. and concentricity tolerances within 0.0005 in. Machine handles rotors from one to 4½ in. dia. Rotors of 3⅜ in. OD, with 2-in. stack, are ground at the rate of 180 per hr—*Engleberg, Inc, 831 W Fayette St, Syracuse, NY*

MORE DATA? Circle 55, inside back cover

Automatically Fed Centerless Grinder Grinds 250 Universal Crosses per Hour

This Van Norman 2C centerless grinder has been equipped with an automatic loader and an automatic gaging system. So equipped, it loads, orients, grinds and gages 250 universal crosses per hour for a major automotive concern.

The loading and indexing mechanism is arranged so that one workpiece at a time is fed to the machine. The machine goes through its grinding, spark-out, and retraction cycle; then the drum fixture rotates 90°, which automatically orients the parts 90° as well. At this time another part is dropped into starting position.

There are now two parts on the workrest blade of the machine, one having been ground on the first two journals and a new unground part in the other position.

The machine once again goes through its automatic cycle, and the parts are again deposited in the rotating drum and the drum rotates 90° as before. The first part has now been finish ground and is ejected into a chute leading to the automatic gaging station. Meanwhile the second part moves into the No. 2 position and a new part is introduced to the first position.

In the gaging station a probe is automatically lowered over one journal at a time. Indicating lights on the gaging panel record the size of each journal. The panel has ten lights in sets of five. The bottom row shows actual readings recorded by the probe at each measuring operation. The upper row of lights stores this information, and the final results after four measurements are made are shown on the upper lights. The first light is amber and will be lit if the part is undersize; the next light is green and will light if the part is approaching low tolerances; the middle green light indicates the part is on size; the next green light indicates an approach to the high tolerances; the next light is red and indicates an oversize part.

If the approach high light is lit more than three times during a measuring cycle, the machine automatically compensates, bringing the next part into the mean dimension. If the approach low light is lit more than three times, the machine stops and the wheel must be retracted slightly. If either the amber or red light is lit, the machine stops and must be reset manually.

The journal diameters have 0.0005-in. tolerance; limits set on the machine are 0.0003 in. Finish obtained is 15 RMS or better and a conservative figure is 1200 pieces per dress.

The machine is so arranged that after this number of pieces is ground the machine automatically stops and a dressing cycle is called for. The machine will not operate again until the dressing cycle has been completed.

Van Norman Machine Co, Springfield, Mass

MORE DATA? Circle 56, inside back cover

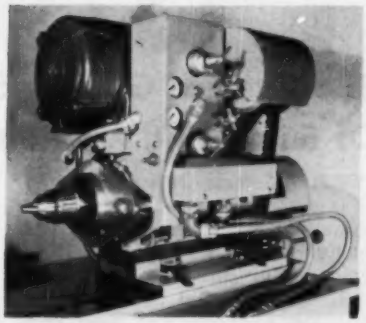
Allegheny Ludlum Introduces Tungsten-Carbide Cutting Material

This ultra-hard steel cutting tungsten carbide, CA-604, is a super high speed cutting material that operates in the fast cutting ceramic area. It retains its high strength at high cutting temperatures, and provides rapid finishing with light to medium feeds.

As with the other 600 series materials, CA-604 contains titanium and tantalum carbide in the form of mixed crystals. It will give long wear life on such operations as precision boring and turning, where size tolerances and surface finishes must be held. At this time, the material is offered only in indexable blanks.

Allegheny Ludlum Steel Corp, Pittsburgh 22, Penna

MORE DATA? Circle 57, inside back cover



Automatic Drill Unit Provides Stepless Speeds up to 12,000 rpm

The BECO Model 505 offers stepless speed adjustment over the range from 600 to 12,000 rpm with a single-speed 1725-rpm motor. In addition to drilling and tapping, the machine is suited for single-point-tool hollow milling, end forming, pointing and chamfering. The tools use a No. 3 Jacobs taper and slip on in place of the drill chuck.

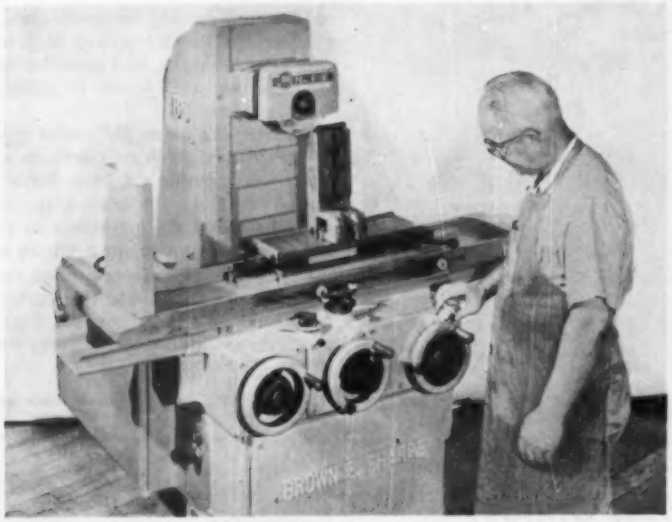
The one-piece spindle is supported at both ends in a quill, with no splines or slip joints between the spindle bearings. The front quill bearing is adjustable to take up all excess looseness.

Machine has a chuck capacity up to ½ in. Stroke is adjustable up to 1½ in. with repeat on hole depth within ±0.002 in. Thrust is 980 lb at 100-psi max air pressure.

Among the accessories available are a hydraulic attachment to control drill break-through; automatic self-reversing tapping attachments from No. 3 to No. 10 taps and from No. 10 to 5/16 in. inclusive; and a broken tap detector that stops the unit if the drill or tap should break.

Batchelder Engineering Co, Inc, Springfield, Vt

MORE DATA? Circle 58, inside back cover



B&S Surface Grinder Speeds Grinding Of Small and Medium-Sized Workpieces

The 618 Micromaster surface grinder is designed for rapid, highly accurate surface grinding of small and medium-sized workpieces. It is available in three basic models—with hydraulic and hand longitudinal, and hydraulic and hand cross feeds; with hydraulic and hand longitudinal, and hand cross feeds; and with hand longitudinal and hand cross feeds.

As the number implies, the 618 grinds work up to 6 in. wide and 18 in. long. Using an 8-in. wheel, with the vertical adjustment handwheel located on the bed, work to 14 in. high can be handled; with the handwheel on the upright, the maximum work height is 12 in. Extra-vertical-capacity parts increase these capacities to 18 in. and 16 in. respectively.

The new Oriflex drive to the flanged spindle is through five O-rings (used as drive belts). A choice of Oriflex or direct motor drive is offered. The Oriflex drive spindle runs at 2860 rpm (with an 8-in. wheel); the direct driven spindle (with a 7-in. wheel) at 3450 rpm.

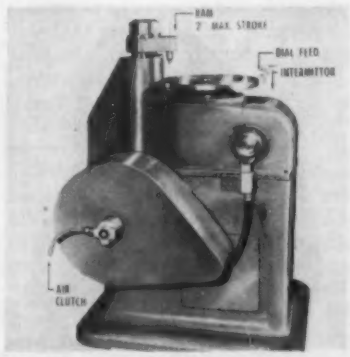
The spindle slide upright moves transversely on V-ways and flat guide ways, eliminating the conventional carriage, and thereby preventing table twist. Vertical and cross feed handwheels read to 0.0002 in. An auxiliary vertical feed dial reads to 0.0001 in.

Hydraulic longitudinal feed of the table is adjustable from five to 100 fpm for the full travel of 22 in. Cross feed is adjustable from 0.01 to 0.25 in., available at each table reversal. A cog belt drive to the table provides smooth, positive hand travel. A lever provides instantaneous changeover from the selected intermittent cross feed to a continuous feed of 10 ipm for wheel truing, and vice versa. Another position of this lever results in a continuous cross feed of 12 fpm for rapid positioning of the wheel.

A wide range of accessories is available, including a spindle downfeed arrangement and a vertical rapid positioning system.

Brown & Sharpe Mfg Co, Providence 1, RI

MORE DATA? Circle 59, inside back cover



Dial Feed and Mechanical Press Combined for Automatic Assembly

High speed precision index table, similar to that used in rotary transfer machines for automatic assembly, is available integrated with a dieing machine press with the crank below the table. Known as the Pressambler, unit is designed for automatic assembly operations which include a press function such as crimping, riveting, or other forming methods, or for dial-fed secondary press operations.

Line includes dials up to 18 in. in dia with either 4, 6, 8, or 12 stations on presses with capacities from 5 to 15 tons and strokes from ½ to 2 in. at speeds over 200 spm. Press unit is installed in the machine base below the dial to reduce clearance requirements and simplify assembly and maintenance. Press and dial of the standard model are cycled either manually or automatically by a single power assembly and an air-operated clutch and brake. Separate clutching can be provided and controlled electrically for longer work cycles.

Ferguson Machine Corp of Indiana, 7818 Maplewood Industrial Court, St Louis 17, Mo

MORE DATA? Circle 60, inside back cover

500-ton Hydraulic Press Offered For High-Speed Hot Forging Jobs

Elmes hydraulic press is designed for both open and closed die work. Bolster plates are fastened to the slide and press bed, with T-slots provided. Keyways are cut into bolsters to facilitate die alignment and to prevent misalignment of dies during forging operations. Long bronze-bushed guides are used on the slide with full tonnage stops around the columns to prevent overstroking.

Unit can be operated by either of

V-R Multiple tooling cuts at BOTH 450 and 113 s. f. p. m.

How V-R Carbide and TANTUNG® cast alloy gang up to solve cutting problems

PROBLEM: How to bore 2" I.D. at 113 SFPM while turning 8" O.D. at 450 SFPM.

SOLUTION: A V-R toolholder and throw away insert will perform perfectly on the 450 SFPM O.D. but the 113 SFPM boring speed demands the cutting qualities of V-R TANTUNG cast alloy. TANTUNG is especially engineered for speeds between carbide and High Speed Steel.

V-R Carbide and TANTUNG make a perfect tooling team to solve this and many other cutting problems. Ask your V-R Representative or write for complete information. V-R Engineers will be glad to work with you on all of your cutting problems.

25 YEAR

V-R

Vascoloy-Ramet corporation

PRIME MANUFACTURERS OF REFRACTORY METALS ENGINEERED FOR THE JOB

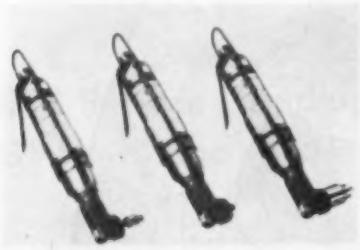
CT-702

838 Market Street • Waukegan, Illinois

two control levers, one at the press itself, one remotely located. Same control levers are used to obtain short and rapid planishing strokes at full pressure. Speed of operation is under control of the operator at all times because of proportioning type of pump control furnished. This type of control also enables the operator to set dies without any adjustments or changes in the control system. Main hydraulic pump is a shifting type, eliminating use of conventional four-way operating valve.

American Steel Foundries, 1150-A Tennessee Ave, Cincinnati 29, Ohio

MORE DATA? Circle 61, inside back cover



Portable Pneumatic Tools Operate In Close Quarters

Series of Keller air tools, designed for drilling or assembly operations in close quarters, includes the 12L-2 screwdriver, the 16L-2 nutsetter, and the 11L-2 angle drill (left-to-right). Tools weigh 2¼ to 3⅜ lb.

Each tool is available in five sizes with speeds ranging from 3200 rpm for the smallest sizes to 450 rpm for the largest. Basic motors used in the three tools are identical. Each tool comes with a standard attachment, but three to six optional attachments are available for each.

The angle drill, 5/32-in. capacity, is offered with a standard right-angle drill attachment with No. 0 chuck taper driver, and chuck key. The screwdriver handles machine screw sizes from No. 6 to ¼ in. Standard equipment is a straight drive 90° angle attachment with No. 10-32 threaded bit holder, one bit and finder. The nutsetters range in capacity from No. 6 to ¼ in. machine nuts. Standard equipment is a straight-drive 90° angle attachment with a ¼-in. square single-end socket driver.

Gardner-Denver Co, Quincy, Ill

MORE DATA? Circle 62, inside back cover

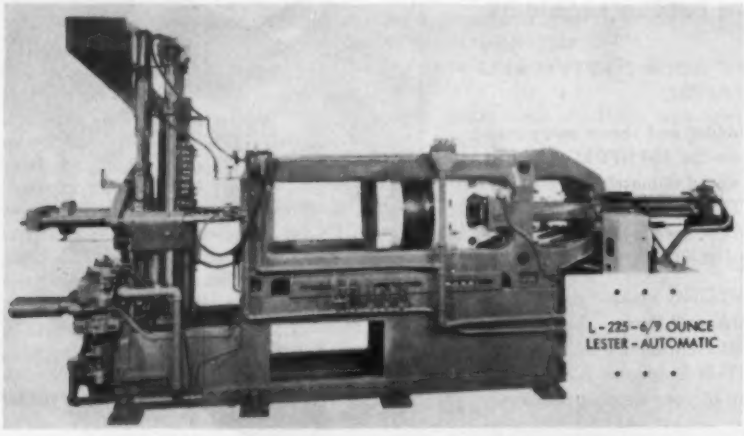
Process Reduces Internal Stress In Heat-Treated Aluminum Shapes

A thermo-mechanical procedure developed by Alcoa is reported to reduce the internal stresses caused by quenching aluminum after heat treatment. When unbalanced by subsequent machining operations, these stresses can warp and twist parts out of shape.

This new process relieves the internal stresses by superimposing a system of thermal gradients opposite to those which created the stresses during the quenching operation. Chief value will be in providing complex, fully heat-treated aluminum shapes—particularly die forgings—with a low level of internal stress. Mechanical properties remain essentially unchanged.

Aluminum Company of America, Pittsburgh 19, Penna

MORE DATA? Circle 63, inside back cover



INJECTION MOLDING MACHINE, the L-225-6/9 Ounce Lester, is said to offer the longest adjustable stroke commercially available—from 16 to 8 in. with total daylight of 38 in. Dry cycle on an 8-in. stroke is 4 seconds; on a 16-in. stroke, 5 sec. Mold clearance between the beams is 20 in. horizontal by 17⅜ in. vertical. Unit is furnished complete with three die height spacer rings for adaptability to a variety of mold sizes. Clamping tonnage is 225 tons. Nominal shot size of the machine is 6 oz on a single feed and 9 oz on a double feed; plasticizing capacity in general purpose polystyrene is 150 lbs per hr—*Lester-Phoenix, Inc, Dept N-41, 2711 Church Ave, Cleveland 13, Ohio*

MORE DATA? Circle 65, inside back cover

Worktables Have Interchangeable Work Tops to Suit Job

Trade-named Swaptops, these worktables provide quicker initial setup and easier product changeover. The steel ribbed frames offer firm support for the interchangeable, quick-release work tops. Latch-on leg assemblies, a variable back service panel and optional shelves, skirts, wiring, etc, add to the versatility.

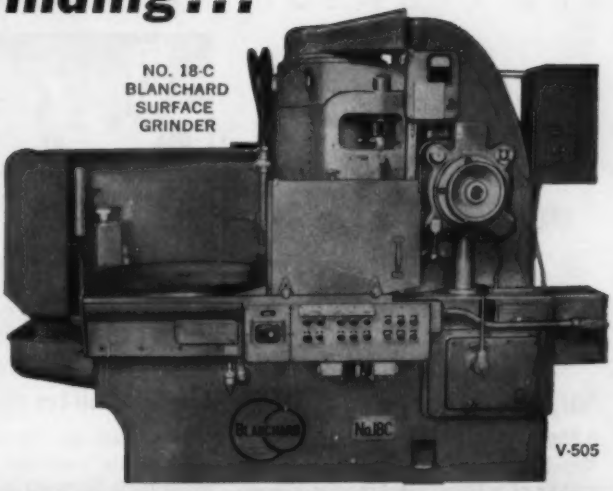
Assembly is speeded by the use of cam-latch devices instead of nuts, bolts and screws. Standard size frames are 48, 60 and 72 in. long, and 24 and 30 in. deep. Work tops may be one-piece, full-frame or individual work-position size. Thicknesses and material are optional. Thicknesses vary from ½ to 1 in. Materials available include plywood, flakeboard, maple, etc; surfacing materials include Masonite, Formica, linoleum, cork. Interchangeable foot inserts provide additional height.

Johnson Products, Inc, PO Box 484, Wilton, Conn

MORE DATA? Circle 64, inside back cover

For better, easier grinding...

Whether you're "hogging" off stock from rough castings or precision grinding to a tolerance of ±.0005", you can do it better and easier with the Blanchard No. 18-C Surface Grinder. Once the work is set up, the automatic cycle handles every operation from start to finish. The operator is free to prepare the next load of work or to operate a second No. 18-C Grinder.



Cast Iron Plate. Blanchard ground at the rate of 30 pieces – 60 surfaces – per hour. Stock removal ⅛" each side.

Steel Bars. Blanchard ground at the rate of 48 pieces – 192 surfaces – per hour. Stock .040"-.045" from each side. Limits ±.001" square, flat and parallel.

Hot Rolled Steel Cams. One operator and one No. 18-C Blanchard produce 225 pieces – 450 surfaces – per hour. Stock removal 1/32" each side. Limits ±.001".

just push a button...

- Automatic size control to ±.0005"
- Duplication of repetitive loads
- Pre-set "spark out" time for flatness and surface finish
- No more "operator worry" on close work – greatly reduced fatigue
- A large part of operator's time available for
  (a) Handling or slushing work pieces
  (b) Filing burrs
  (c) Selecting correct wheel and preparing for next job
- Specially-designed sizing device with built-in feature to compensate – automatically – for wheel wear during grinding cycle.

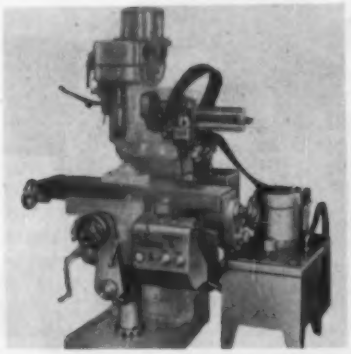
All of these features give you *more efficiency at reduced costs!*

PUT IT ON THE BLANCHARD

Send for your free copy of Model 18-C folder.

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.



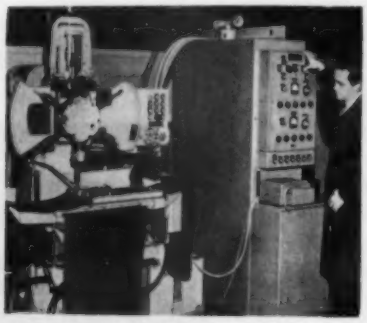
Fully Automatic Tracing System Adapts to All Milling Machines

Synchro-Trace is adaptable to all makes of milling machines as a complete attachment for die sinking and mold making. System allows mill to be used as a conventional mill, with hand or power feed, or as a fully automatic die sinker.

Pick feed on either cross or longitudinal feeds is infinitely variable from 0.002 to 0.250. Cutter feed is uniform regardless of angle or shape of pattern; vertical walls are duplicated with ease. Stylus oversize remains constant, regardless of feed rate. Similar system can be adapted to lathes, vertical turret lathes, and boring mills.

True-Trace Sales Corp, PO Box 3307, El Monte, Calif

MORE DATA? Circle 66, inside back cover



Tape-Controlled Turret Drill Speeds Small-Lot Production

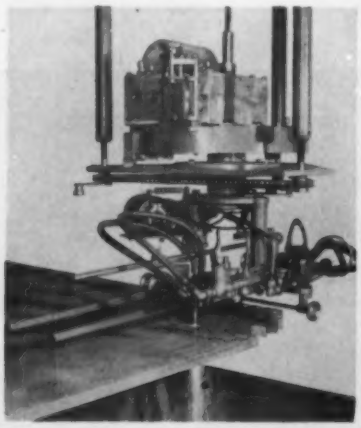
The six-spindle Model 2 BHT turret drilling machine is numerically controlled through a General Electric two-motion numerical positioning unit. Designed specifically for automating small-lot production jobs, the machine is reportedly capable of handling 95% of all basic drilling requirements with tools up to ¾ in. dia in mild steel. Test runs on job lots from one to 427 parts have resulted in savings ranging from 32 to 95%.

Equipped to drill, tap, counterbore, countersink, ream, undercut, and spotface, the turret indexes to each new station for a change of hole diameter or tool. Each spindle has a preselected speed and each has independent, infinitely adjustable feed rate. Spindles can be selected from the punched tape in any sequence.

Data input can be in the form of punched tape for fully automatic operation, or through manually set decade switches for semi-automatic operation.

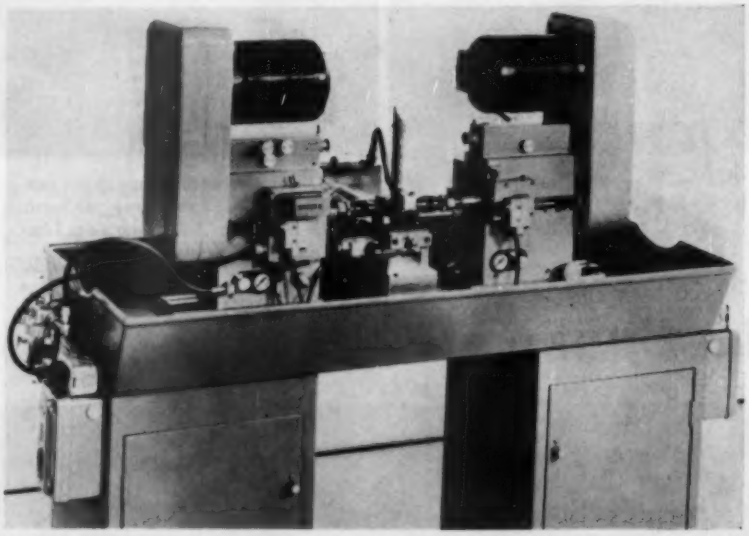
Burg Tool Mfg Co, Gardena, Calif

MORE DATA? Circle 68, inside back cover



SPROCKET CUTTING MACHINE, called the Schrock Thermo-Cut, can cut roller chain sprockets from 4 in. to 90 in. in diameter, 4 tooth and up. Setup and cutting time are minimized. Special shapes can be cut through the use of specially designed cams. Tolerances can be held to within 0.010 in. —*Western Conveyor Co, Box 357, Boise, Idaho*

MORE DATA? Circle 67, inside back cover



Automatic Drilling and Tapping Unit Speeds Second Operations on Parts

Two-spindle horizontal opposed drilling and tapping machine is designed to handle second operations on screw machine parts, die castings, stampings, or headed parts. Typical uses include deburring or chamfering of both sides or ends of nuts, rods, shafts, or tubing.

Spindle speed ranges are available from 500 to 10,000 rpm. Each automatic drilling unit has a full range of controls, and synchronizes for either simultaneous or alternate spindle movement up to 500 cycles per minute. Depth control of 0.0005 in. can be obtained. Drilling units adjust on dovetail slides to a minimum center distance of 3 in. and max of 23 in. between nose of spindles.

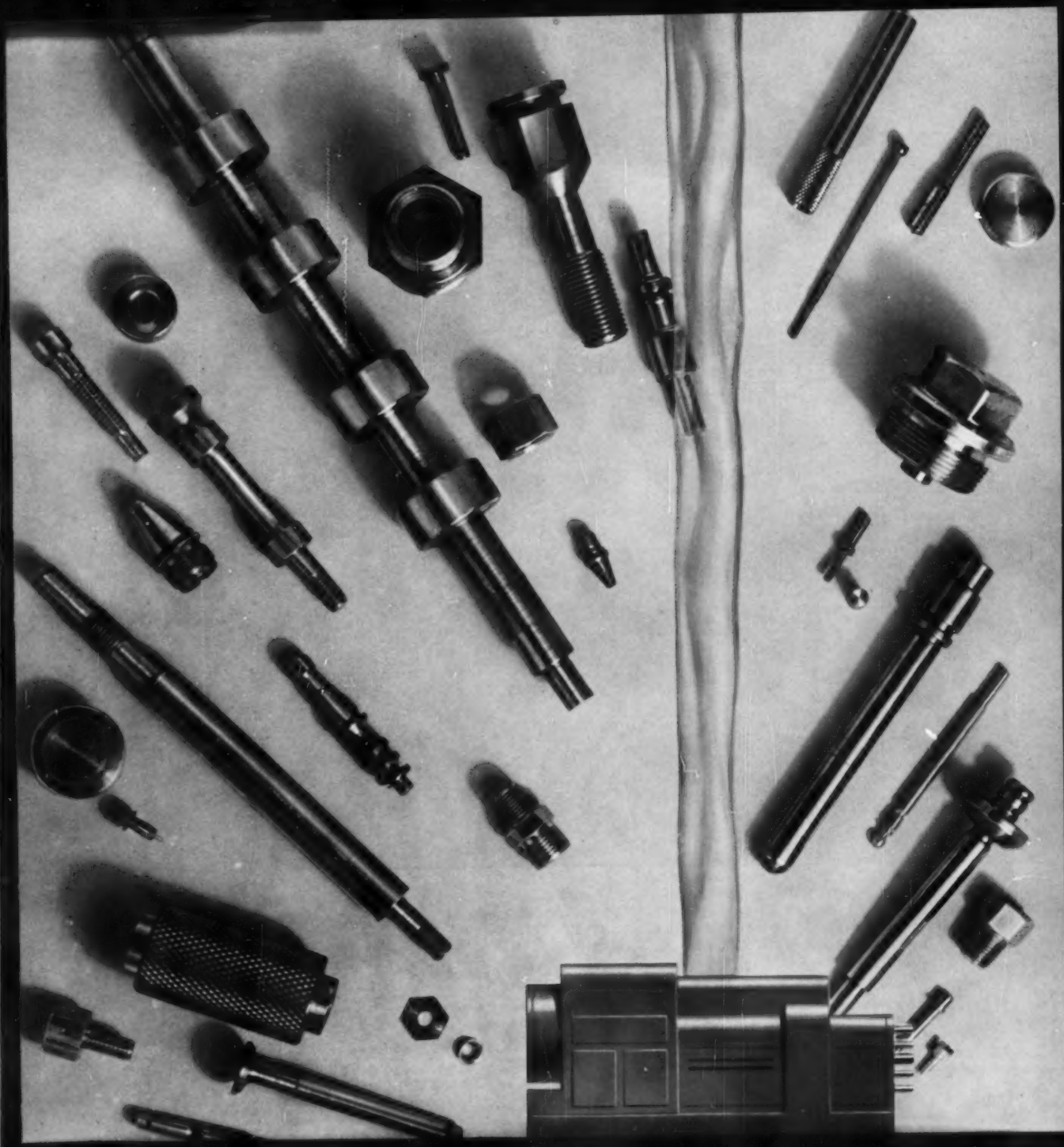
Capacity includes 0.020 to ⅜-in. drilling and up to ⅜-in. tapping in mild steel. Operated on shop air pressure of 80 to 100 lbs, built-in regulators, air feed controls, and hydraulic feed units reduce and adjust rate of spindle travel. Spindle stroke up to 2½ in. is possible.

Universal-Automatic Corp (formerly Unimatic Machine Co), 9545 Ainslie St, Schiller Park, Ill

MORE DATA? Circle 69, inside back cover

(continued on page 149)

CIRCLE 259 READER SERVICE CARD



1/3 MORE PRODUCTION FROM 7 OUT OF 10 AUTOMATICS

with

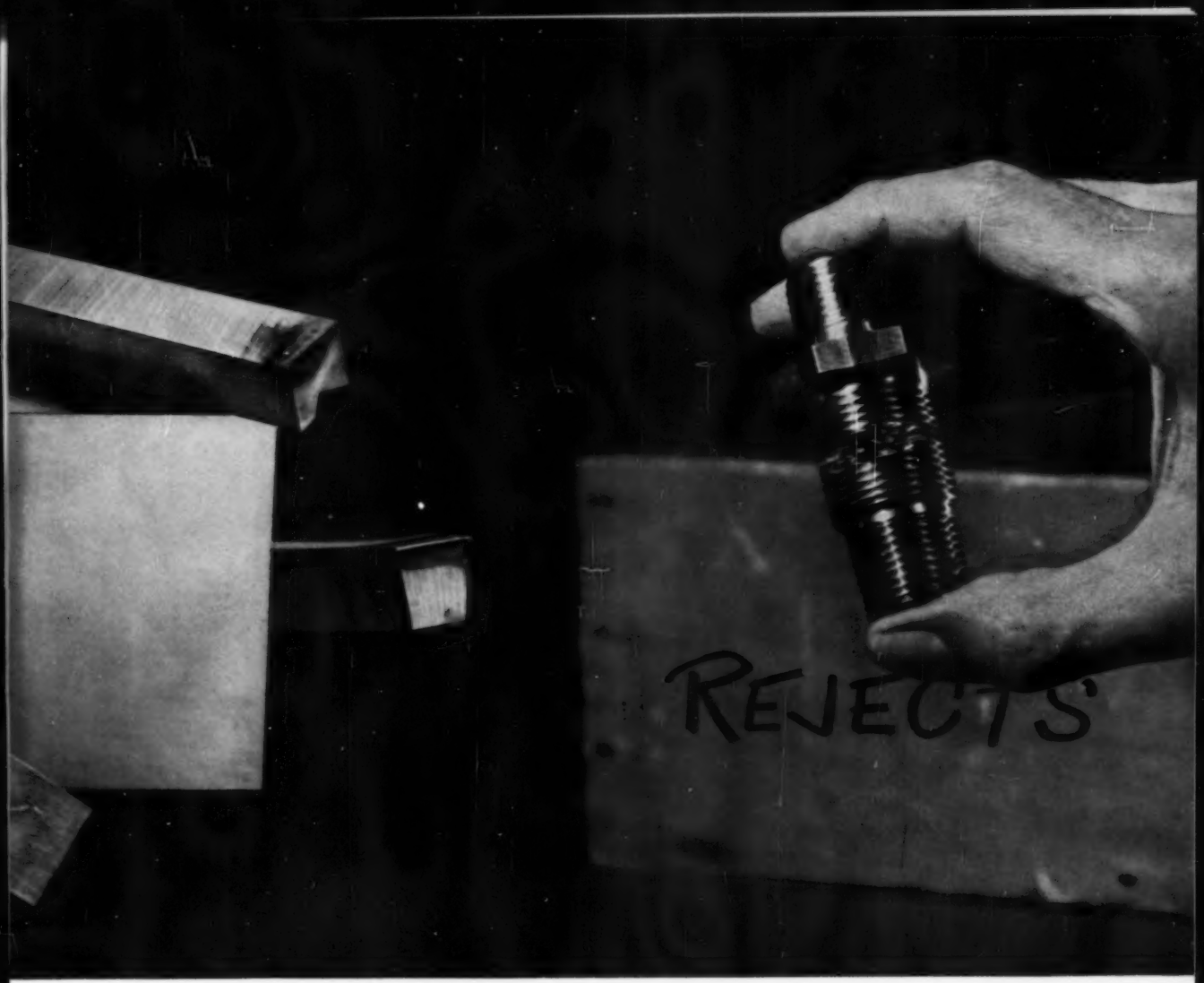
the Texaco Cleartex Cure

TEXACO

3 TO 8 GALLONS OF LUBE OIL PER SHIFT leak into the cutting oil sump on 7 out of 10 automatics now operating. This cumulative reduction of cutting oil efficiency is actually to blame for many screw machine problems.

SHORT TOOL LIFE due to chip weld, cratering, burning, can often be traced directly to lube oil dilution of cutting oil effectiveness. Your

Diluted cutting oil causes costly troubles in automatic screw machines . . . short tool life . . . frequent downtime. Diluted cutting oil can be cured . . . forever! Prove it yourself . . . Start the Texaco



saving in tool regrinds, tool replacement and downtime offsets the price of premium Cleartex many times over.

A CRITICAL SYMPTOM of cutting oil dilution in your automatic screw machines is excessive scrap production. Another, and earlier one to watch for, is frequent need to refill lubricating oil sumps.

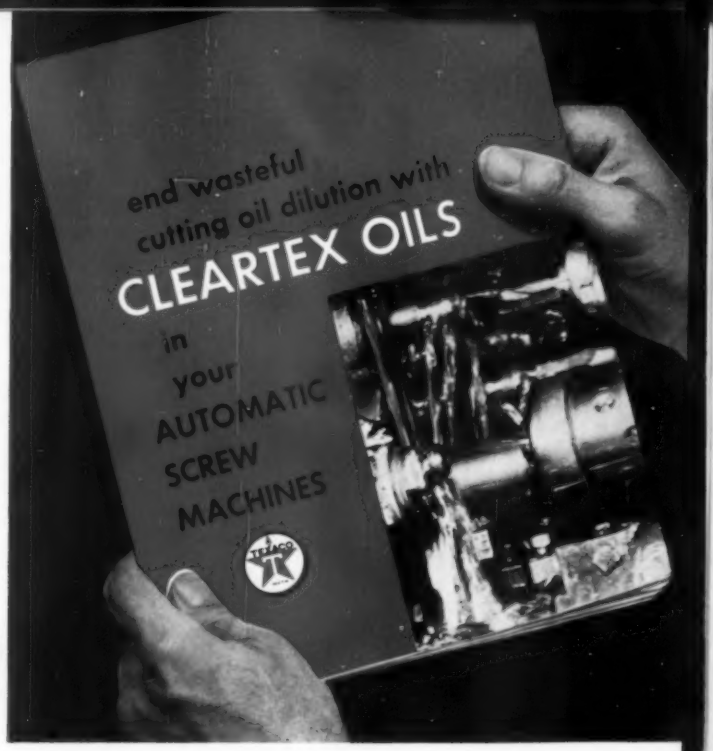
HERE'S HOW: First, call in a Texaco Lubrication Engineer. Let him survey your automatic set-up—metals being machined, operating conditions, etc. Then, if your automatic screw machines are of the vast majority that can benefit from the Texaco Cleartex Cure, use a Cleartex Oil for *both* cutting and lubricating in just one machine as a test. On 70% of automatics in use today, men in charge of production and maintenance run into recurring troubles that they can actually cure with this one decision.

Cleartex Cure

TURN PAGE FOR DETAILS OF METHOD

SEND FOR THIS NEW TEXACO BOOK NOW!

To do your job . . . stop waste and boost output . . . compete better on quality . . . you need to know what Cleartex Oils can do in automatic screw machines. This book spells it out.



See for yourself how Cleartex helps you reduce operating costs

How Cutting Oil Is Diluted

When lubricating and hydraulic oils leak into the cutting oil sump, the cutting oil is diluted. It loses strength; ingredients that make it an efficient cutting oil become less and less effective. This happens more frequently than is realized.

One way to make a quick check is to keep a record of how much lubricating oil (or hydraulic fluid) is being added to a machine. Lube oil make-up is a good measure of dilution on the cutting oil side and a sign that tool life and production is probably being lost.

Cleartex Cures the Problem

Texaco Cleartex Oils were developed to cure this problem forever.

The Cleartex Series are transparent, non-corrosive products. Despite their non-corrosive features, they do have relatively high extreme pressure properties, which make them well suited as general purpose cutting oils for use in a wide variety of operations where requirements are normal.

On non-ferrous metals, they are particularly effective because they are non-corrosive.

They are also excellent as machine tool lubricants and hydraulic fluids, principally because of their exceptional chemical stability, load carrying ability and rust preventing properties. Thus, they are truly efficient dual or tri-purpose oils. In addition, Cleartex Oils have excellent odor, color, E.P. properties, corrosion protection.

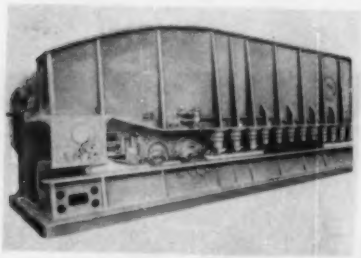
How to Set Up a Test

Cleartex Oils are demonstrably superior to any dual or tri-purpose lubricants available today. It also seems apparent that the cost of operating 70% of the automatic screw machines can be reduced by the use of a Cleartex Oil. We say this because on automatic screw machines that now use the new Texaco Cleartex Oils for cutting, lubricating, and (if needed) hydraulic fluid, difficulties of short tool life, rejects and downtime have been cured, or definitely reduced.

Why don't you arrange with a Texaco Engineer to make a test on one machine—or on an entire line if you want to go for the savings immediately. Contact any one of Texaco's 2,000 Distributing Plants in the 48 States, or write to The Texas Company, 135 East 42nd Street, New York 17, N. Y.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)



Heavy-Duty Roller Shear Has Cutting Length up to 60 ft

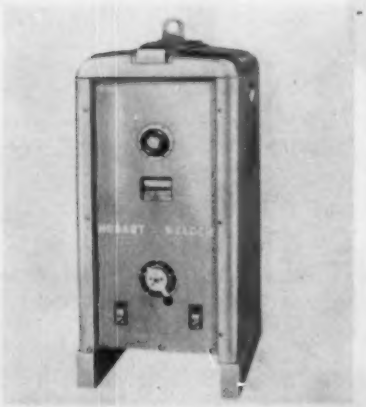
This heavy-duty roller shear, built in Germany by Schulze & Naumann, is available in five different models providing shearing capacity up to 1½ in., cutting length up to 60 ft, and maximum deviation from a straight line, on a 40-ft-long cut, of no more than 0.0125 in.

Plates are sheared between a lower blade and an upper shearing roller that runs along the lower blade at speeds up to 112 fpm. The carriage, traveling alongside the bed, carries two shearing heads, one for straight cuts and one for bevel cuts —with rapid changeover from one to the other.

The shears can also be equipped with a variety of planing attachments to convert the machines into combination shear/plate-edge planers.

Imported by Cosa Corp, 405 Lexington Ave, New York 17, NY

MORE DATA? Circle 70, inside back cover



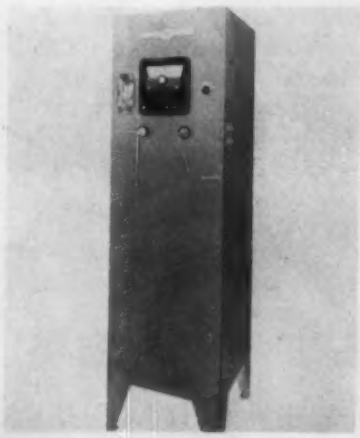
Lowcost AC Transformer Welder Has 500-Ampere Rating

The Budget 500, a lowcost AC transformer-type arc welder, is rated 500 amps, at 40 volts, on 60% duty cycle. It has a welding range of 100 to 625 amps in three overlapping main step settings of 100 to 300, 195 to 475, and 375 to 625 amps. These coarse adjustment steps, with rheostat for fine adjustment, provide dual control to permit choice of open circuit voltage to suit the job at hand.

Double primary on the transformer permits operation on either 230 or 460 volts. No high voltage appears across any control coils, eliminating possibility of insulation breakdown or high voltage appearing under the rheostat handle. Welder is 48 in. high, 21¼ in. wide, 21¼ in. deep and weighs 524 lb.

Hobart Brothers Co, Hobart Square, Troy, Ohio

MORE DATA? Circle 71, inside back cover



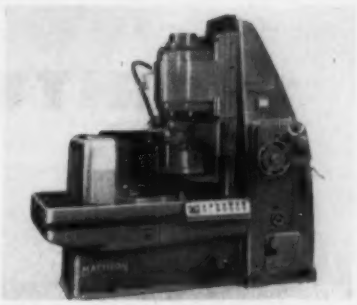
Redesign Improves Efficiency Of Endothermic Generator

Design features that allow more accurate control of gas-to-air ratio, retort chamber temperature, carbon pressure, and low dewpoint have been incorporated into Type IGL generators. These units are a mixture of air and natural gas, propane, or manufactured gas to deliver precisely controlled medium or high carbon-potential protective atmospheres for heat treating the more difficult and complex steels, carbonitriding mild steels, and for controlled-sintering operations.

Design features include precise-acting carburetor that maintains accurate control of gas/air ratio even under varying pressure loads; new straight-through retort that permits removal or replacement of catalyst without removing retort from generator; new heat-exchanger design.

C I Hayes, Inc, 810 Wellington Ave, Cranston, RI

MORE DATA? Circle 72, inside back cover



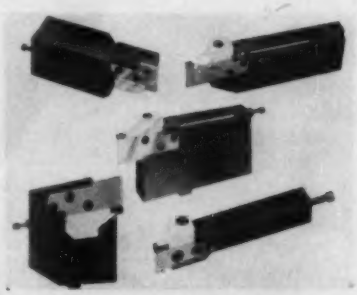
Quick-Tilt Spindle Designed For Rotary Surface Grinders

Quick-tilting device for creating wheel clearance on vertical-spindle rotary surface grinders makes it possible to convert from rough to finish grinding in seconds so that both high stock removal and flat grinding can be accomplished on every job. Spindle is available as optional equipment on all Mattison No. 24 and 36 models.

Every chuck load can be rough ground first, using an arbitrary 0.010-in. wheel tilt. Location of the low point makes no difference as long as there is stock available for finishing. Spindle can be rapidly re turned to the vertical position and a light finishing cut taken to produce perfectly flat parts. Selector switch on the column actuates an air cylinder that automatically tilts the wheelhead and spindle toward the work, or back to dead flat. After reducing the rate of downfeed slightly to keep power draw at optimum, machine is ready for the finishing cut and sparkout.

Mattison Machine Works, Rockford, Ill

MORE DATA? Circle 73, inside back cover

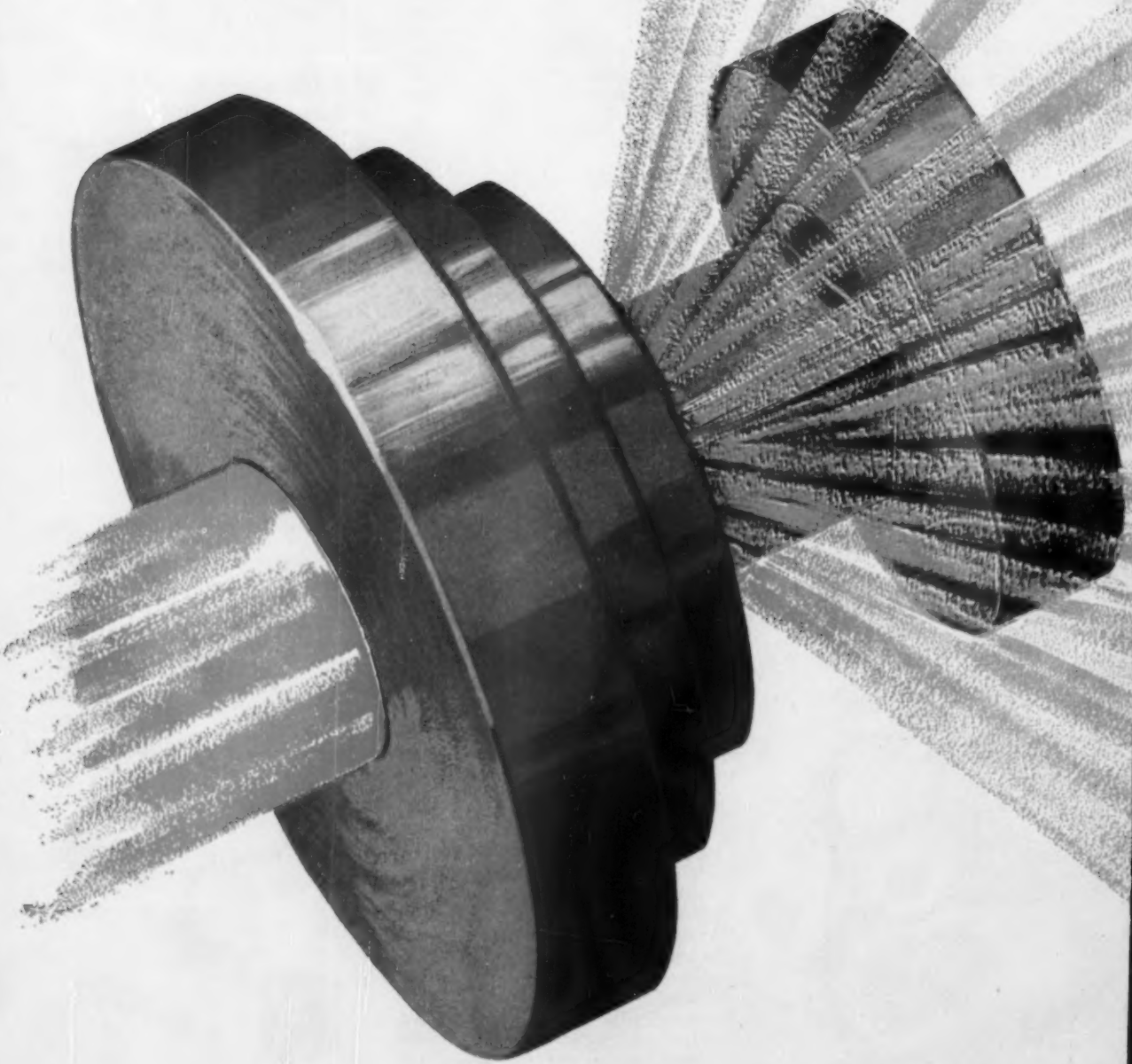


New Cutoff Tools Offered For Variety of Machines

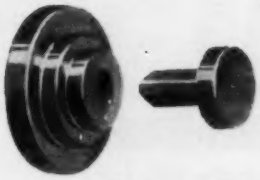
Holders are now available for any cutting-off machine, turret lathe, engine lathe or automatic. Wide selec-

(Continued on page 152)

FOR THE MACHINERY PART



THAT TAKES THE BEATING



Liquids forced at high pressure through restricting valves—of HAYNES STELLITE alloy! That's the modern way by which hundreds of products are homogenized today, to make better dairy, chemical, food, and textile products, to name a few.

HAYNES alloys have been a standard material for homogenizer valves for 25 years. Valves that remain free from roughness, porosity, sharp corners, pits. Valves that retain their dimensions where pressures may reach 15,000 psi, and liquid velocities exceed 30,000 ft. per minute. Valves that keep products clean and free from contamination and give long service despite corrosive and abrasive conditions.

If design and production in your field call for tough metal parts, look into HAYNES alloys. There are more than 15 to choose from including HAYNES STELLITE cobalt-base alloys, HAYNES iron-base alloys, HAYSTELLITE cast tungsten carbide, and HASTELLOY nickel-base alloys. They are available as castings forgings, completely fabricated parts, or as sheet and bar stock. All parts can be furnished machined or ground to specified size and finish.

Our engineers will help you pick the right HAYNES alloy to resist practically any condition of wear, heat, or corrosion. For more information write for descriptive literature.

HAYNES Alloys *will do the job!*

HAYNES ALLOYS

HAYNES STELLITE COMPANY

Division of
Union Carbide Corporation
Kokomo, Indiana

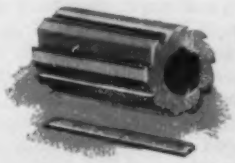
UNION CARBIDE

The terms "Haynes," "Haynes Stellite," "Hastelloy," "Haystellite," and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

TYPICAL "HAYNES" ALLOY MACHINERY PARTS

Chuck inserts of HAYNES STELLITE alloy last up to 50 days—2 shifts daily—holding heavy pieces during a cut-off operation.

Seam rollers on milk-can machines turn out 2 to 3 times as many cans now that the rollers are made of HAYNES STELLITE alloy.



Cutters and bed knives made of HAYNES STELLITE alloy stay clean and sharp for years while pelletizing extruded polystyrene.

tion of Manchester line of carbide cutoff tools is designed specifically for each type of machine.

V-blade support assures accurate location of the carbide insert. Inserts are always on center and will not lead off during cutting. Design is said to provide longer tool life under heavier feeds and speeds, in addition to a 15-second insert change. Adjustable stop provides positive backing to prevent insert from sliding, plus a method of adjustment after the insert is re-ground. Solid inserts of special molded carbide are butt-welded to the steel shank and cost less than other carbide cutoff tools, according to manufacturer.

Portage Double Quick, Inc, 1026 Sweitzer Ave, Akron 11, Ohio

MORE DATA? Circle 74, inside back cover

Dixon Screw and Nut Driver Incorporates Improved Features

Auto-Torque Driver consists of the parts positioner head, introduced last year, plus a compact air-motor drive for the spindle, and a newly developed parts feeder which requires no auxiliary motor or vibrator. In addition it is equipped with a built-in sensing mechanism which stops the machine if a part is missing or only partially driven, and an adjustable-torque clutch said to be accurate within 5% of the torque setting, with even closer tolerance available for special applications.

Clutch is furnished in two torque ranges to provide for high and low torque requirements: 5 in.-oz to 84 in.-lb, and 48 to 120 in.-lb. Driver can be furnished with floor mount and treadle to initiate the cycle, or as a completely automatic station with electrical connections and solenoid valve to initiate cycle automatically.

Dixon Automatic Tool, Inc, 2300-23rd Ave, Rockford, Ill

MORE DATA? Circle 75, inside back cover

2000-lb Capacity Lift Truck Stacks to Height of 11 ft

Model FT 20-24, available for gasoline on LP fuel, is powered by a 4-cylinder, 133 cu-in. heavy-duty engine delivering 35 brake hp at 2400 rpm. Two transmissions are available, the standard 2-speed constant mesh or, as optional equipment, the Allis-Chalmers Power-Shift Torque Converter Drive.

Mast gives max stacking height of 131¼ in., over-all lowered height of 83 in., and 16¼ in. of free lift. Over-all width is 32 in., outside turning radius is 62 in. With aid of center point steering, operator can turn in a minimum radius in either direction.

Allis-Chalmers Mfg Co, Engine-Material Handling Div, Milwaukee, Wis

MORE DATA? Circle 76, inside back cover

Bendix Unit Prepares Tapes For 2-D and 3-D Contour Machining

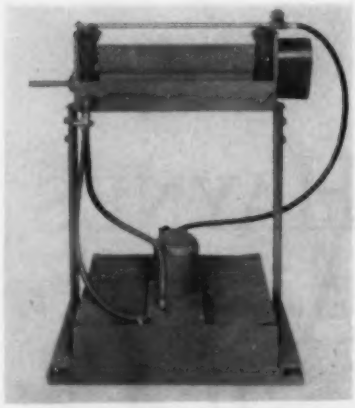
Designated the Compac System, this is a digital processing system for producing control tapes for two- and three-dimensional contour machining of parts composed of straight lines, arcs, circles and free form or point-defined curves. It takes dimensional and machining information from engineering drawings and produces a coded punched control tape.

The system includes the following equipment: a prepared form, called a process sheet; a Flexowriter with a tape punch; a Bendix G-15D general purpose digital computer; and a set of computer programs.

According to Bendix, a tooling or process engineer can be trained to use this system in less than a week.

Bendix Aviation Corp, Industrial Controls Section, 21820 Wyoming Ave, Detroit 37, Mich

MORE DATA? Circle 77, inside back cover



Strip Stock Oiler Handles Stock Up to 72 in. in Width

Heavy-duty strip stock oiler, Model B, lubricates strip stock leading to a press at any desired height. It handles stock from 26 to 7 gage in widths from 24 to 72 in. Light, medium or heavy oils may be used. Oil is pumped by a ½-hp motor from a reservoir to the wool-covered steel rolls.

Other models are available, with gravity or forced feed, to handle stock of practically any gage or width.

Stamping Specialty Co, Inc, 2141 N Sherman Dr, Indianapolis 18, Ind

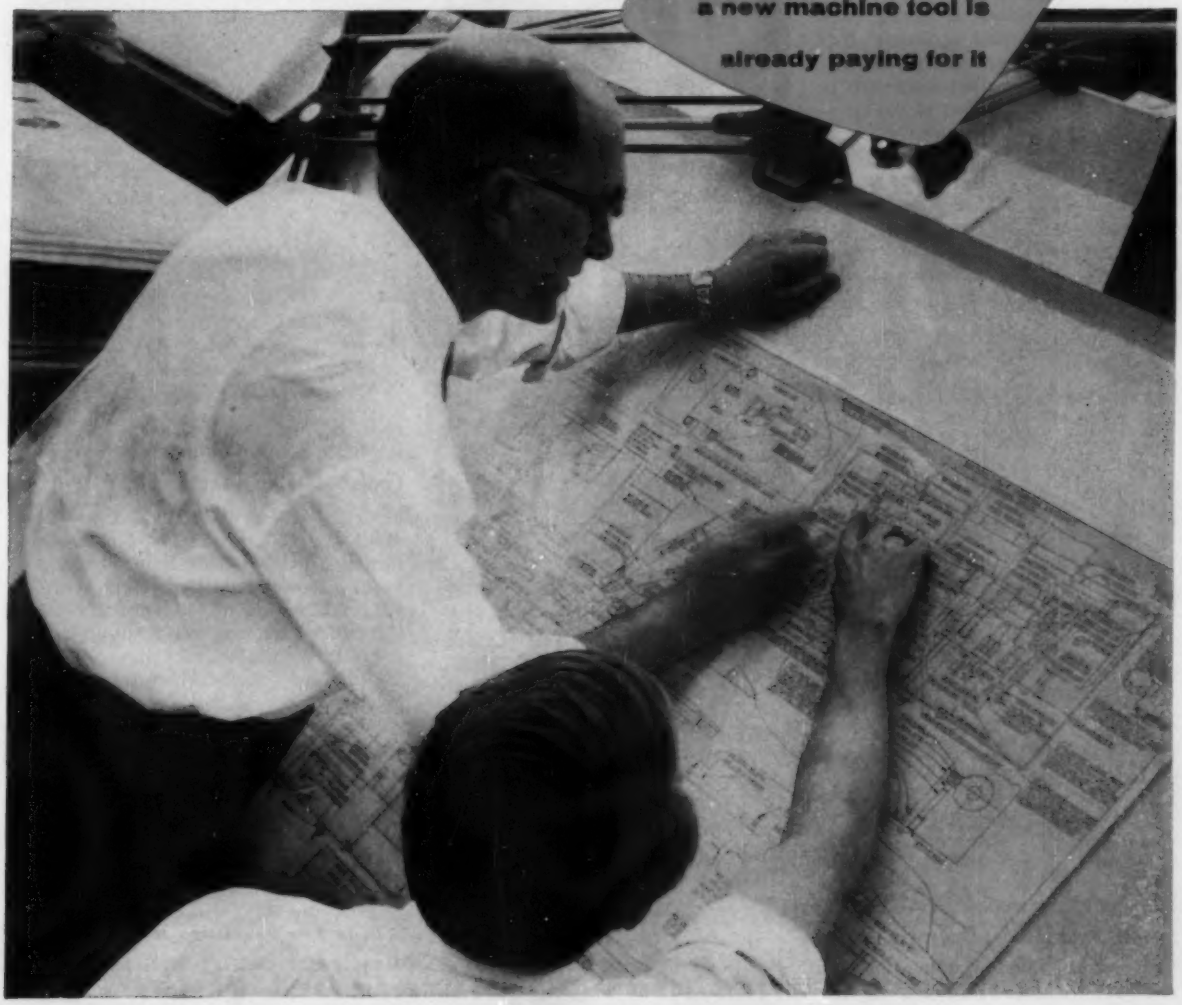
MORE DATA? Circle 78, inside back cover

New Caliper Thread Gage Speeds Handling of Shouldered Work

Horstmann caliper external thread gage, made in England, incorporates sets of Go and No-Go fixed jaws in

JONES & LAMSON MACHINE COMPANY

the man who needs a new machine tool is already paying for it



Your good ideas . . . how long do they live?

The answer is simple: They live only as long as top management in your company is *convinced* that they will be profitable. The hard part is in the convincing. Particularly when initial capital expenditures are necessary.

Want some help? Our new 16mm. color-and-sound movie, "The Price of Eggs", tells how to move a production idea toward profit. It can be related to methods changes, production volume, new designs, new products, or *any* facet of your operation which deals with keeping manufacturing costs competitively low. And it contains no "commercial". A group showing to your top production and management people will be an eye opener. It's yours—with no obligation.

Write to Jones & Lamson Machine Co., 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Fay Automatic Lathes • Milling & Centering Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

a streamlined frame; it is designed to facilitate checking operations, and particularly to speed the handling of shouldered work.

Jaws are capable of adjustment to a variety of positions as gaging surfaces are radial and eccentric. Numerous gaging positions can be obtained. Fixed jaw arrangement is said to give a better feel of the components passing through, and all shearing action is eliminated—features especially useful in gaging soft metals. Units are available in standard types and sizes, and in the thread sizes listed in military specifications MIL-S-7742 and in Air Force-Navy Design Standard AND-10056.

Distributed by Production Equipment Co, Glenolden, Penna

MORE DATA? Circle 79, inside back cover

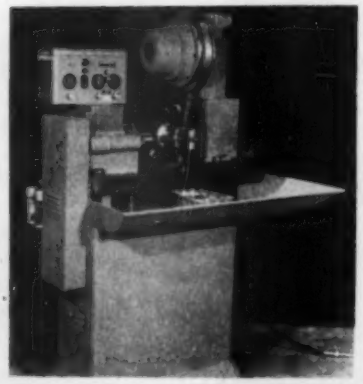
Self-Centering Double Stock Reel Speeds Press Room Operations

Unit can be loaded with stock on one side while the other side is unwinding; when one side has been unwound, the reel is easily unlocked, swung about, and new coil of stock is in place ready for use.

Heavy-duty model is available with either magnetic brakes or standard friction drag brakes. Quick-adjusting forks are standard equipment on all reels. Smaller size unit handles material up to 10 in. wide on a max outside coil diameter of 44 in. and up to 500 lbs on each side. Larger model takes coils up to 1000 lbs in weight on each side with max outside stock coil diameter of 48 in. and 13-in.-wide stock. Both units have self-centering core from 6 in. min up to 24 in. max.

Durant Tool Co, Thurbers Ave, Providence, RI

MORE DATA? Circle 80, inside back cover



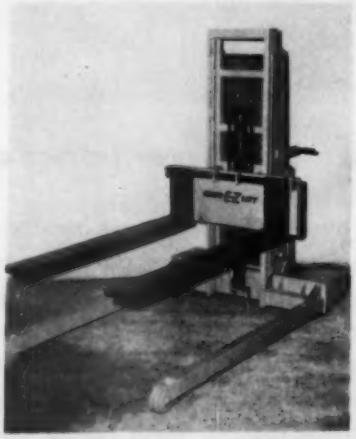
Rivet Drilling and Tapping Unit Produces up to 3200 Parts per hr

Automatic model is basically a horizontal application of the same operating principles used in Snow vertical machines for drilling, tapping, and threading.

Machine may be used with a hand-feed magazine for short runs, or with hopper feed for long runs. Automatic air-operated cylinder clamps part securely for drilling or tapping. Production rate of 500 to 3200 per hr is said to be easily obtained, depending on hole size and material. Capacity varies from No. 72 drill (0.022 in.) to ⅜ in. with spindle speeds from 500 to 10,500 rpm. Tolerance on depth is within 0.002 in.

Snow Mfg Co, Bellwood, Ill

MORE DATA? Circle 81, inside back cover



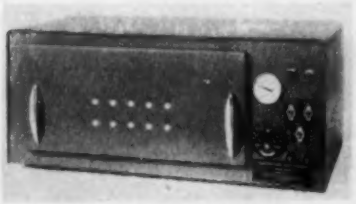
Battery-Operated Lift Truck Has Adjustable Fork Spread

Model L-582 lift truck is powered by a 12-v battery, has a lifting height of 60 in. and a lifting capacity of 3000 lb. The 62-in.-long forks are laterally adjustable to provide a spread of 20 to 38 in.

Other specifications include an over-all height of 82 in. and a width of 50 in. Equipped with 6-in.-dia hard rubber front wheels and 8-in.-dia hard rubber swivel casters, this truck is reported to be highly maneuverable.

Crown Controls Co, Inc, New Bremen, Ohio

MORE DATA? Circle 82, inside back cover



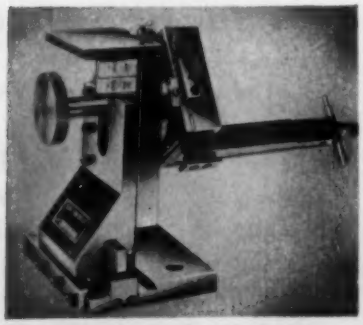
Portable Testing Chamber Cools to —100, Heats to 500 F

Model 6545W weighs 40 lbs, automatically cools to —100 F in 5-6 minutes, heats to 500 F in 30 minutes, and keeps desired test temperature within ± 2 degrees over the entire range by use of an anticipator thermostat.

Unit uses liquid carbon-dioxide as cooling agent, a nichrome filament (650 w) for attaining max heating temperatures, plus a centrifugal blower air circulator for temperature uniformity. Chamber operates on any 115-v 60-c outlet. Test capacity is increased to a 16 x 7 x 7-in. drawer. Outside dimensions are 24 x 10 x 14½ in.

Delta Design Engineers, Inc, 3039 Adams Ave, San Diego 16, Calif

MORE DATA? Circle 83, inside back cover

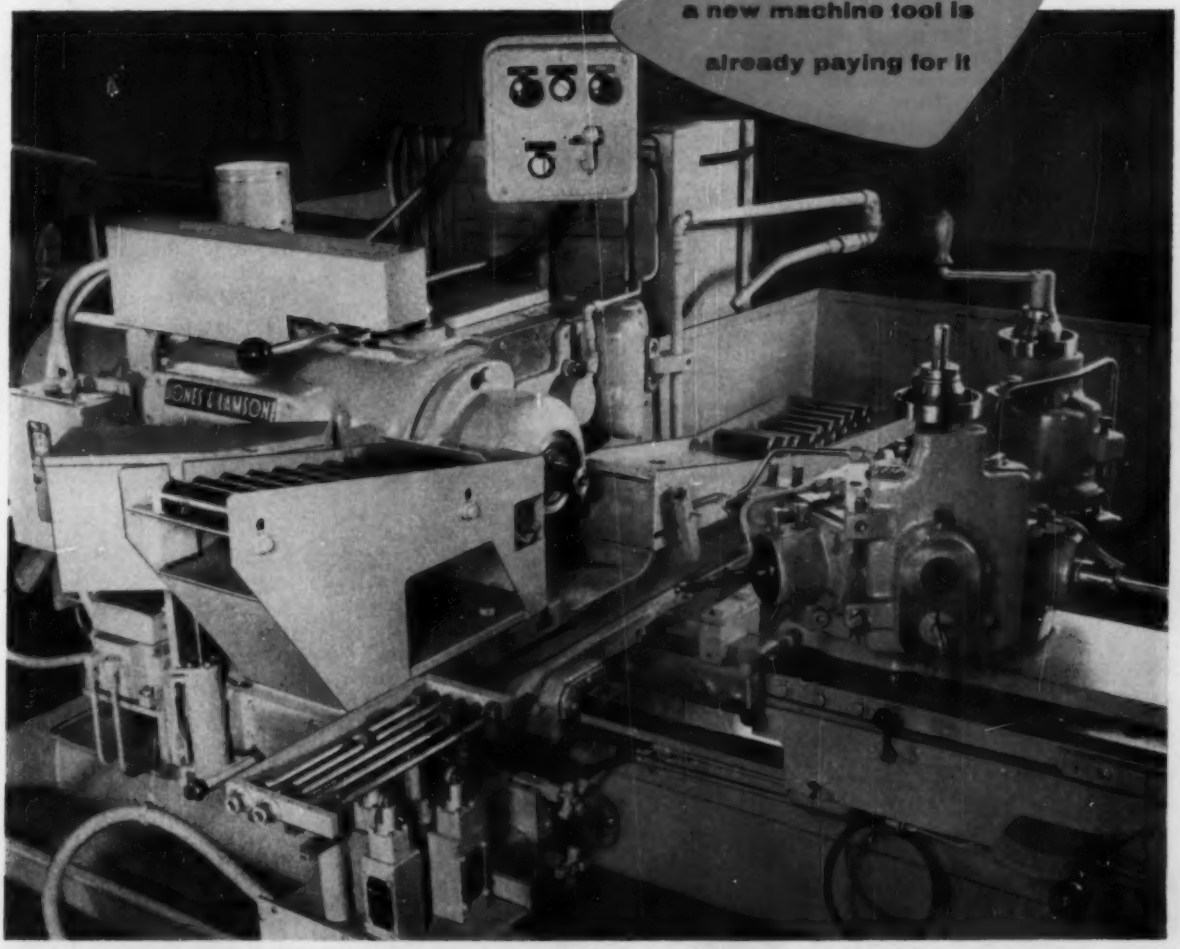


Dresser Grinds Any Combination Of Radii and Angles

Zenith form dresser permits grinding any amount of radii and tangent in one setup without moving the

JONES & LAMSON "AUTOMATION"

the man who needs a new machine tool is already paying for it



Fully Automatic Turret Lathe operation reduces machining costs by 32%

This J & L Automatic Ram Type Turret Lathe with Lynn Hydraulic drive provides completely automatic operation from start to stop. A magazine feed for automatic work handling has been mounted on the cross slide. However, on applications where cross slide tooling is necessary, handling devices can be arranged that will free either the front or rear of the cross slide for tooling.

Fourteen similar parts of varying dimensions are produced on this same machine. The tooling used is basically the same as that used in the former, hand-operated method. However, on machining time alone, costs are reduced by 32%. Operator attention for this set-up is only one-third of that previously required. In addition, studies show that one operator can run two or more of these automatics with less fatigue than is involved in running one manual machine. Needless to say, J & L's long-standing reputation for turret lathe accuracy is retained throughout. Write for catalog 5808. Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Fay Automatic Lathes • Milling & Centering Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

dresser. It is hardened and triple-ground on all surfaces, and preloaded with balls to take up all wear on the tangent travel and on radial movement.

Gage blocks are the controlling factor, and all movements of the diamond are dead accurate, according to manufacturer. There is no need for adding or subtracting from pre-arranged sizes; size of the radii corresponds exactly with the gage blocks used. Dresser can be used on the side of grinding wheels by removing column slide, indicating plate, and control knob. By removing the gooseneck, it can be used as a whirl-a-jig. Unit is furnished in a mahogany box, complete with diamond, setup block, and sine bar.

R & A Tool and Engineering Co, 7338 Woodward Ave, Detroit 2, Mich

MORE DATA? Circle 84, inside back cover

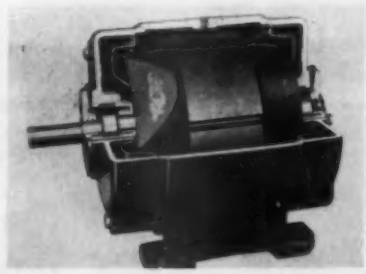
Portable Hydraulic Bender Handles up to 2½-in.-dia Pipe

Machine has a built-in 20-ton ram-design bender powered by a self-contained 1200-rpm, 2000-psi, 5-gpm hydraulic pump and tank unit. It is designed to bend electrical conduit pipe up to 2½-in. dia, solid bars up to 1½-in. dia, and angle forms.

Adjustable bends with radii five times the pipe diameter can be produced on the machine. Bending dies for ½, ¾, 1, 1¼, 1½, and 2½-in.-dia pipe are furnished with the unit, together with a standard pipe vise mounted on the work surface. Push-button operation is provided for the bending function, including inch forward and inch return for positive control. Co-acting limit switch can be set to permit the machine to make duplicate bends. Unit is 3 ft wide, 5 ft long, 3½ ft high.

Walter P Hill, Inc, 22183 Telegraph Rd, Detroit 19, Mich

MORE DATA? Circle 85, inside back cover



Allis-Chalmers Machine Tool Motors Have Epoxy Insulation

Super-Seal motors with epoxy-encapsulated stator windings simplify machine tool specifications by allowing the use of an open motor in many applications usually calling for some sort of protected motor. The epoxy provides protection against moisture, dirty coolant, oily grit, dust and fine chips.

These motors can carry (continuously) a 15% horsepower overload. Service factor allows use of a smaller motor in some cases or it provides a buffer against unexpected or shock loads.

The manufacturer claims impressive cost savings—as much as 30% on motors up to 60 hp as compared to totally-enclosed motors.

Allis-Chalmers Mfg Co, Milwaukee 1, Wis

MORE DATA? Circle 86, inside back cover

3-kw Ultrasonic Generator Can Be Remote Controlled

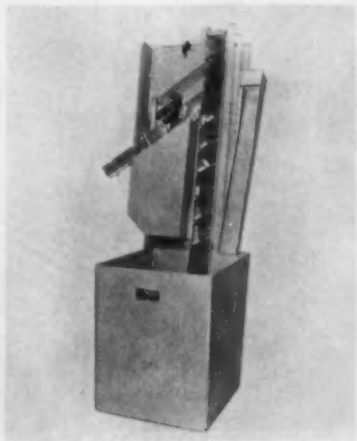
Model APT-500 Sonogen generator with 3-kw average power output is designed for high-volume production cleaning and will activate up to 6 sq ft of transducer area, or 300 gallons of cleaning solution.

Remote control panel connects to the unit through a multi-conductor cable. Panel can be incorporated with other instruments located at a central control area. Both remote and local control panels hold filament and plate power switches, line voltage meter, and pushbuttons for motor tuning. This type of tuning provides easy and reliable frequency adjustment between 36-40 kc, necessary for max cleaning efficiency.

Unit powers conveyorized systems as well as other large, all-ultrasonic cleaning installations. Twin oscillator construction allows the generator to activate two cleaning tanks independently, useful for cleaning and rinsing, or for degreasing operations where parts are often so heavily soiled that two stages are required. The 350-lb model measures 30 x 24 x 72 in. high and is constructed of ⅛-in. aluminum.

Branson Ultrasonic Corp, 40 Brown House Rd, Stamford, Conn

MORE DATA? Circle 87, inside back cover



Portable Automatic Feeder Handles Sliding and Rolling Parts

Completely automatic, the Model 2200-C high-speed feeder features compact size, self-contained drive, and simple installation. It feeds sliding parts ⅛ to 1 in. in diameter from ½ to 3 in. long, rolling parts ⅜ to 3 in. in diameter and from ⅛ to 1 in. in thickness.

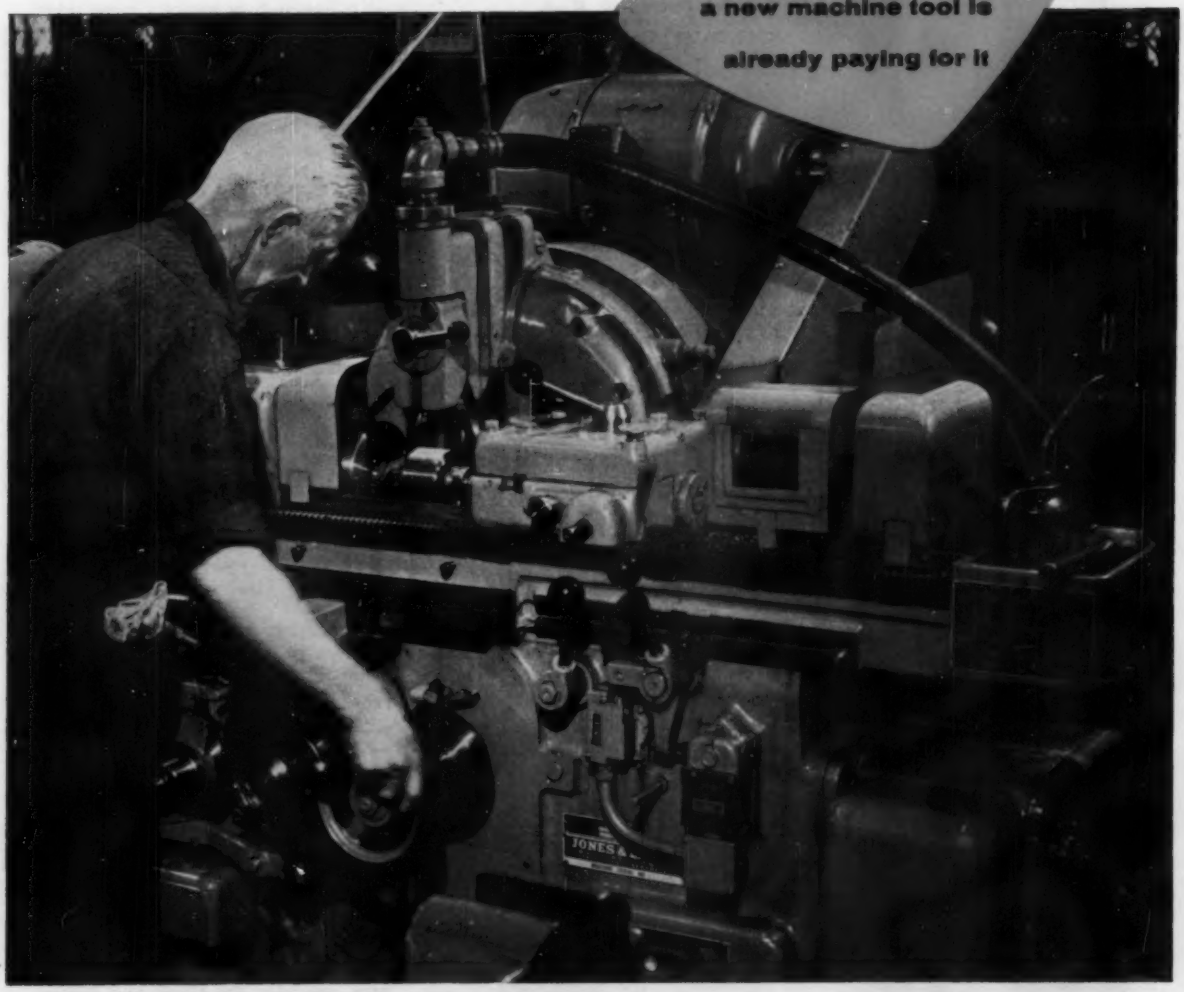
The 6-cu-ft hopper and 6-in.-wide belt offer flexibility for a wide range of parts and provide adequate capacity for volume production. Overall size is 30 x 56 x 94 in. high. Loading height is 38 in. above floor, with take-off available on left or right hand side or both. Automatic cycling controls are available.

Feedall, Inc, 38399 Pelton Rd, Willoughby, Ohio

MORE DATA? Circle 88, inside back cover

JONES & LAMSON MACHINE TOOLS

the man who needs a new machine tool is already paying for it



Close Tolerance Tool Room Work on an Automatic machine with Universal Application

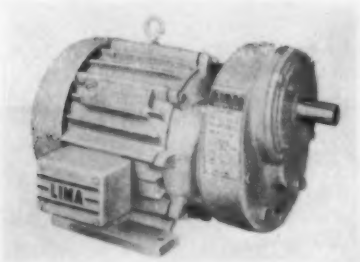
A customer writes: "The versatility of Jones & Lamson Thread Grinders is scarcely tested in the conventional production of hobs, taps, gages and threaded parts. In our toolroom, using the thread grinder as a basis for 'Rube Goldberg' development, we have produced precision racks, small form-profiled milling cutters, oil grooves and grinding wheel crushers.

"While serving the purpose as a necessary piece of equipment, this machine also provides a means by which many additional production problems can be explored and tested. Applying the thread grinder to toolroom problems is putting the best foot forward for quickly producing accurate and dependable shop accessories."

* * *

Write for catalog 600. Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Fay Automatic Lathes • Milling & Centering Machines • Thread & Form Grinders • Optical Comparators • Thread Tools



Gearmotors in Range of Sizes Are Added to Lima Line

Line consists of single, double, and triple reduction units, integrally motor mounted, with Duti-rated lifetime gearing. Motor capacities are rated from 1 to 125 hp, with output reduction speeds from 780 to 7½ rpm. Units are adapted for horizontal foot-mounted applications. Dripproof, totally enclosed, and explosion-proof models are available.

Standard electrical characteristics are normal torque, 3 or 2 phase, 60 c, 208, 220/440, or 550 v. Special voltages and frequencies, along with mechanical modifications are available.

Lima Electric Motor Co, Dept 132, Lima Ohio

MORE DATA? Circle 89, inside back cover

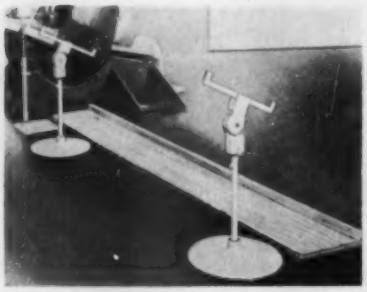
Air-Operated Drill Jigs Offered in Bridge Models

Two styles of bridge units, the Wedge-lok, and the Air-lok, incorporate twin air cylinders built into the base casting which actuate the jig posts to raise and lower the bushing plate. All dimensions are identical with Woodworth's Style No. 4 Cone-lok jig, except the over-all height—base casting is 1 in. thicker than the hand-operated model.

Wedge-lok includes an internal locking mechanism on each post. Bushing plate remains in a clamped position with the air off. Air-lok depends upon a constant line pressure to effect clamping. Both styles are equipped with a control valve to adjust the speed of the bushing plate on the downstroke.

N A Woodworth Co, 1300 E Nine Mile Rd, Detroit 20, Mich

MORE DATA? Circle 90, inside back cover



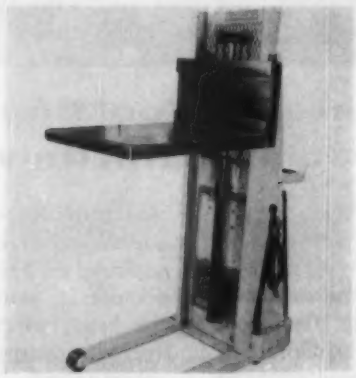
Adjustable Metal Stands Support Stock for Feeding

Type AS stock stands hold a customer-built wood tray at any height or angle for supporting strip stock being fed to a stamping machine. Each stand is adjustable in height from 28 to 42 in., and is inclinable to any desired angle. Two of them are said to support up to 1000 lbs.

Stands may be used also in portable conveyor systems and as supports for tables or benches. They are easily moved by rolling on the round base.

Stamping Specialty Co, 2141 N Sherman Drive, Indianapolis 18, Ind

MORE DATA? Circle 91, inside back cover



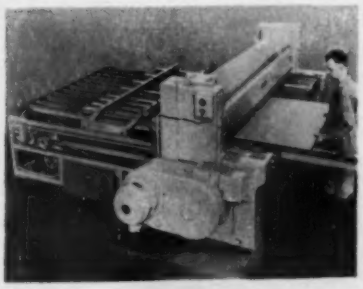
Electro-Hydraulic Elevators Designed for Intermediate Jobs

Line of lightweight, portable units for use in intermediate materials handling operations includes platform lifts, fork lifts, hinged, telescopic, and drum handling models.

Called the Weld-Bilt Hy-Boy Verti-Lift, it is electro-hydraulically operated by a 12-v battery system. Lift is operated through a unitized hydraulic pump power unit actuating a heavy-duty hydraulic cylinder and ram together with dual leaf-type chains. Wheels are roller-bearing equipped. Standard model has a 64-in. lift, with solid platform, and lifting capacity up to 1500 lbs. A fork lift elevator is available for pallet handling, with forks adjustable in width to enter pallets of varying sizes.

West Bend Equipment Corp, 328 Water St, West Bend, Wis

MORE DATA? Circle 92, inside back cover



Attachment Gages and Feeds Stock From Standard Square Shears

This high-speed automation unit accurately gages and feeds sheet, coil, or strip stock from standard square shears to provide automatic trim or cutoff operations. Called the Shear-Pacer, the unit mounts at the rear of a standard square shear and its electrical control system is integrated with that of the shear.

The Shear-Pacer automatically advances the sheet to the gaging fingers, operates the shear and carries the trimmed sheet to a stacker unit. Stock feed rate is adjustable from 80 to 300 fpm.

A bank of V-belts acts as a transfer table. This table floats up and down with the action of the shear blade. In addition to assuring efficient shearing action, this feature also permits two strips of varying thickness to be sheared simultaneously by using a multiple side gage bar arrangement on the shear.

To prevent stock from humping up at high speed and to increase accuracy of shearing, the unit has pinch rolls that cover about two-thirds of the table area. Changeover from one cutoff length to another is accomplished easily and quickly.

Press Automation Systems, Inc, 25418 Ryan Rd, Warren, Mich

MORE DATA? Circle 93, inside back cover

JONES & LAMSON OPTICAL COMPARATORS

the man who needs a new machine tool is already paying for it

J & L Comparators produce the sharpest, blackest shadow images

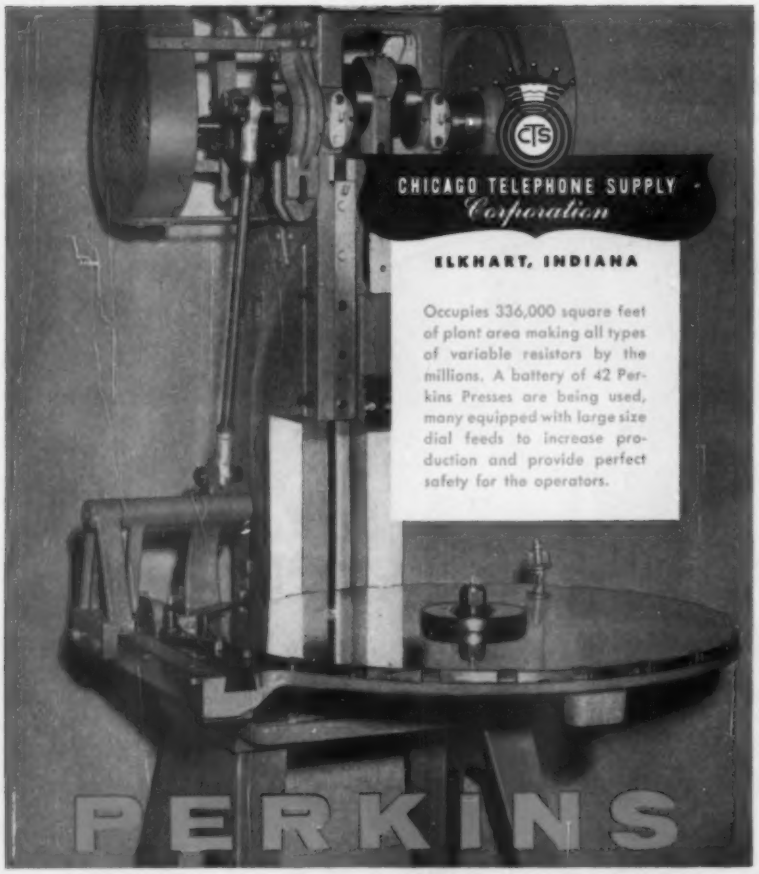
You've often heard the phrase, "There's more to it than meets the eye." This couldn't be truer than when referring to different types of Comparator performance. Screen illumination on J & L Comparators doesn't just *appear* to be brighter—it *is*. Prove it to yourself with a light meter. While doing this you'll find that J & L not only *produces* more illumination—but also *stops* more. Shadow images (which is what we really measure or inspect) are sharper, denser and distortion-free.

And here's something else; J & L Comparators are now being equipped with a NEW VARIABLE LIGHT INTENSITY switch, with built-in filament warm-up. Projection lamp life is materially increased as controlled screen illumination with maximum brilliance is assured. Illumination is reduced when using low magnification lenses and is increased for the higher power lenses. Light potential is used only as required, and lamps last longer.

Write for catalog 5700, which describes many features resulting from J & L's continuous research in optical inspection. Jones & Lamson Machine Company, 502 Clinton Street, Springfield, Vermont.

Turret Lathes • Fay Automatic Lathes • Milling & Centering Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

CIRCLE 268 READER SERVICE CARD


CTS
CHICAGO TELEPHONE SUPPLY
Corporation
ELKHART, INDIANA
Occupies 336,000 square feet of plant area making all types of variable resistors by the millions. A battery of 42 Perkins Presses are being used, many equipped with large size dial feeds to increase production and provide perfect safety for the operators.
PERKINS

PRESSES

have been selected because of the infinite precision necessary in the fabrication of all their component parts. For over half a century manufacturers throughout the nation have depended on Perkins Presses to speed production, assure accuracy, prolong die life and hold down maintenance cost.

Call in a Perkins field engineer and let him help you get maximum production in your press room.

PERKINS
MACHINE COMPANY
WARREN, MASS., U.S.A.

Write Dept. AM-5 for complete Technical Information.

NEW SHOP EQUIPMENT

Hydraulic check valves, for use in systems up to 5000 psi, are available in both sub-plate and sandwich types, and in ¾ and 1¼ in. sizes. The ¾-in. valves pass 20 gpm; the 1¼-in. valve, 65 gpm. Spring loading of the poppet allows the valve to be mounted in any position.

Denison Engineering Div, American Brake Shoe Co, 1160 Dublin Rd, Columbus, Ohio

MORE DATA? Circle 94, inside back cover

Anodic coating for magnesium provides a clear protective coat for magnesium products. New anodize should be used under a laquer or varnish for maximum corrosion protection. Treatment is a modification of the standard Dow 17 anodic treatment, and is applicable to all forms of magnesium, such as castings, sheet, extrusions, and forgings.

Dow Chemical Co, Midland, Mich

MORE DATA? Circle 95, inside back cover

Phosphor bronze wire brushes are designed for applications where sparks may be dangerous or undesirable. Brushes are available as standard in 4- and 6-in. cup types, medium and wide-face wheel type, and both straight and bend-handle hand scratch type. In addition, special styles can be supplied to suit individual requirements.

Anderson Corp, 1029-1039 Southbridge St, Worcester, Mass

MORE DATA? Circle 96, inside back cover

Metal coating, trade-named Dunal, is applied to parts before they are machined. Subsequent machining does not mar or crack the finish. Dunal can be dipped or sprayed on, then baked for a permanent finish.

J Landau & Co, Inc, Carlstadt, NJ

MORE DATA? Circle 97, inside back cover.

"For the last time Smerdley . . . they're blueprints, not 'pitchures'."

BRIDGEPORT BRASS
COPPER ALLOY BULLETIN

Bridgeport Reporting New Developments in Copper-Brass Alloys and Metalworking Methods

The Hankison Condensifilter in which the tubed condenser (left above) is installed.

HOW COPPER BENDS TO THE TASK OF SQUEEZING IMPURITIES OUT OF AIR

Here is a remarkable example of the outstanding *natural* qualities of copper tube—its ability to bend easily, resist corrosion and transfer heat. The Hankison Corporation, Canonsburg, Pa. makes a compressed air Condensifilter, in which they have used ⅜" Bridgeport copper tube in an amazingly compact and efficient condensing unit.

Over 66 feet of the tube is formed into a series of hairpin bends to provide more than 900 square inches of heat exchange area. The unit in which the tube is used is the heart of the Condensifilter. In service, air coming from the compresser passes through this condenser. Cooling water, circulated through the tube, cools the air and causes moisture and oil vapors to condense out of the air stream. The very function of the unit exposes it to corrosive condensate. Copper's natural corrosion resistance, coupled with its workability, makes it virtually the only metal that can do this job so well.

Bridgeport copper and brass alloys lend themselves to many applications that many other metals cannot fill. Their workability, economical cost, resistance to corrosion, and long operating life are important advantages.

To learn more about Bridgeport metals and what they can do for you, call your Bridgeport Salesman. Backed by Bridgeport's Technical Service, he can give you valuable assistance in selecting the metal best suited to your product and production process.

Brass Alloys Offer These Advantages Over Other Metals at Competitive Prices

Today, brass is competitively priced. Everyone can now afford to put superior quality into their finished product by making use of the many advantages only brass can offer. Here are the benefits Bridgeport Alloys give you.

Higher quality—Strip with exceptionally fine surface and close tolerances is produced by our newly installed Sendzimir mills.

Lower finishing cost—The inherent beauty, lustre, and color of solid brass are far superior to those of other materials.

Scrap value—The value of brass scrap is an important factor in *final* metal costs. It offers a more advantageous return than steel or stainless.

Easier fabrication—The excellent machinability of brass means higher production rates and longer tool life.

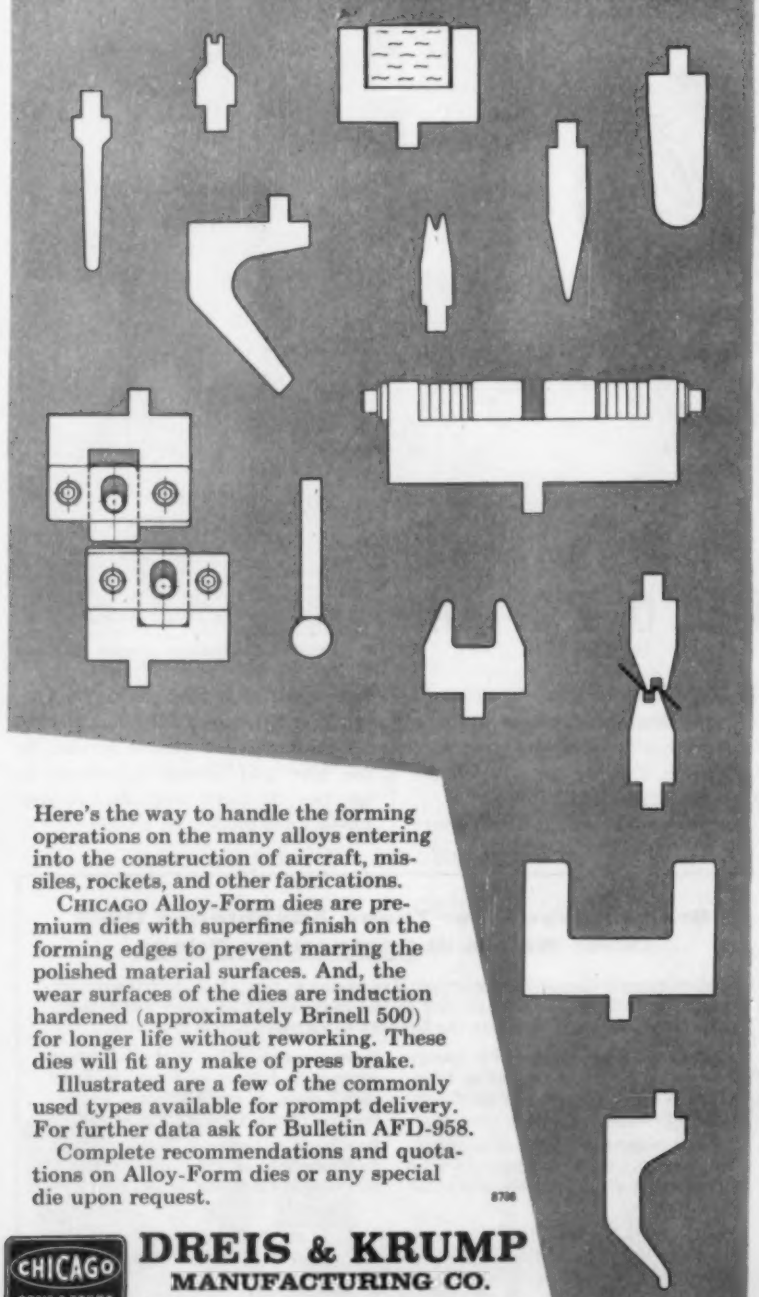
Bridgeport's Technical Service is always ready to show you how brass can do a better job than the metals you are now using. Take advantage of the superiority of brass—call your nearest Bridgeport Sales Office.

BRIDGEPORT BRASS

Bridgeport Brass Company, Bridgeport 2, Connecticut • Offices in Principal Cities
In Canada: Noranda Copper and Brass Limited, Montreal

Alloy Forming for
AIRCRAFT
MISSILES
ROCKETS
and
OTHER FABRICATIONS

CHICAGO®
ALLOY-FORM DIES
For All Makes of Press Brakes



Here's the way to handle the forming operations on the many alloys entering into the construction of aircraft, missiles, rockets, and other fabrications.

CHICAGO Alloy-Form dies are premium dies with superfine finish on the forming edges to prevent marring the polished material surfaces. And, the wear surfaces of the dies are induction hardened (approximately Brinell 500) for longer life without reworking. These dies will fit any make of press brake.

Illustrated are a few of the commonly used types available for prompt delivery. For further data ask for Bulletin AFD-958.

Complete recommendations and quotations on Alloy-Form dies or any special die upon request.

8708

CHICAGO DREIS & KRUMP

DREIS & KRUMP
MANUFACTURING CO.
7434 S. Loomis Blvd., Chicago 36, Illinois

Press Brakes • Press Brake Dies • Straight-Side-Type Presses
Hand and Power Bending Brakes • Special Metal-Forming Machines

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

MACHINES AND ATTACHMENTS

1 OMNIMIL — *Sundstrand Machine Tool Co, 2531 Eleventh St, Rockford, Ill.* 10-page bulletin describes unit for machining at any and all angles by positioning the spindles instead of the work. Either of the two sizes available can handle milling, boring, and drilling in an almost unlimited work range. Illustrations show how the machine handles 15 operations on a housing part in only two part setups.

2 GRINDING AND LAPPING MACHINES—*Norton Co, Worcester 6, Mass.* Revised catalog describes general features of cylindrical, roll, angular, multi-wheel, cam, universal, tool and cutter and special purposes grinding machines and precision lapping machines. Catalog numbers for specific units are listed for requesting additional information.

3 DRILL HEADS — *Cleveland Pneumatic Industries, Inc, 64 Old Orchard, Skokie, Ill.* 4-page illustrated bulletin 7698 gives details on multi-spindle, adjustable universal-joint units. New Models 76 and 98 accommodate up to 9 spindles. Specifications tabulated for four models.

4 RADIAL SAWS — *Rockwell Manufacturing Co, Delta Power Tool Div, 493 N Lexington Ave, Pittsburgh 8, Penna.* 12-page catalog illustrates and provides information on saws that can be used for metalworking to cut light metal sheeting, tubing, and extrusions, and for plastics. Specifications given; accessories described.

5 METAL DISINTEGRATOR — *Cammann Mfg Co, 3700 Henninger Rd, Cleveland 9, Ohio.* 8-page bulletin presents illustrated description of Model C-66 that drills any shape hole in hardened metals, also removes broken taps, drills, reamers, etc.

TOOLS AND ACCESSORIES

6 "CEMENTED CARBIDES FOR INDUSTRY" — *Allegheny Ludlum Steel Corp, Oliver Bldg, Pittsburgh 22, Penna.* 32-page catalog includes all material previously contained in five separate Carmet booklets. New extremely hard cutting grade, CA-604 described; applications include fine finishing with mechanically held inserts. Technical section features six special charts on proper feeds, speeds, and grades of carbide materials to use on various cutting operations.

7 ABRASIVE WHEEL — *Simonds Abrasive Co, Tacony & Fraley Sts, Philadelphia 37, Penna.* 4-page illustrated

"Charge!"

R. W. Creamer, V.P., checks x-ray films of tank welds.

Picture of a man saving $400 per unit

It's done with Kodak Industrial X-ray Film, Type AA

Creamer and Dunlap, Inc., make pressure vessels—big ones, 67 ft. long by 9 ft. in diameter. Because they radiograph every inch of every weld to determine soundness, they can use thinner plate. This results in about 10% less weight with attendant savings in fabrication, handling and shipping. Altogether it adds up to as much as $400 per unit.

What's more, radiography helps to assure customers of a high-quality, safe product.

This company switched to Kodak Industrial X-ray Film, Type AA, because, "This film," they say, "is faster and has superior contrast, definition and radiographic sensitivity."

Your x-ray dealer and the Kodak Technical Representative will gladly tell you how Kodak film can improve your radiographic operation and help you get more out of your present x-ray or gamma-ray equipment. It can pay you to get in touch with them.

Read what Kodak Industrial X-ray Film, Type AA, does for you:

- Speeds up radiographic examinations.
- Gives high subject contrast, increased detail and easy readability at all energy ranges.
- Provides excellent uniformity.
- Reduces the possibility of pressure desensitization under shop conditions.

EASTMAN KODAK COMPANY, *X-ray Division*, Rochester 4, N.Y.

For inspection of welds, Kodak Industrial X-ray Film, Types AA, M, and KK, are available in the 70mm by 550 ft. package, as well as in standard sheet sizes.

Kodak

STEEL *from Wheelock, Lovejoy* BULLETIN

W-L DETROIT For the first time, HY-TEN D-2 air hardening steel now available here in rounds, squares, flats and billets. Also a fine stock of standard alloy grades, especially A-8620, as well as all HY-TEN grades. Excellent service from our new warehouse.

W-L CHICAGO Steady demand for "B" No. 3X for flame-hardened parts such as boring bars. Good stocks of HY-TEN AIS—the best carburizing alloy steel, and freest machining available today—a new W-L exclusive!

W-L CINCINNATI This 23-station Avey Line-O-Dex transfer machine, designed and built by The Avey Division of Motch & Merryweather Machinery Co., Cincinnati, Ohio, is equipped with spindles made of our HY-TEN "B" No. 2. This grade was chosen for its great tensile strength (100,000 P. S. I. in the natural condition), toughness, and fine wearing qualities.

W-L CAMBRIDGE We are now distributing FLEXANGLE, the easy-to-erect structure assembly for all types of racks, shelves, platforms, etc. It's completely universal and low in cost—can be used anywhere, by anyone, for any storage purpose.

W-L HILLSIDE Our stock of flat and square sizes in HY-TEN M Temper Oil Hardening Steel can save you time and money in your tooling program. HY-TEN "B" No. 3X pre-heat treated in rounds, squares and flats available in a wide range of sizes. Billets on hand for hammer forging in all grades of HY-TEN.

W-L CLEVELAND Excellent stock of brake die flats and squares. Also many sizes up to 16" x 18" in HY-TEN Mold Steel. Excellent deliveries.

W-L BUFFALO A wide range of rounds and hexagons in cold drawn AISI leaded and non-leaded A-4140. Also many sizes of the new "B" No. 3X-40 in rounds and hexagons.

Write our Cambridge office today for your *free* Wheelock, Lovejoy Data Sheets. They'll give you complete technical information on grades, applications, physical properties, tests, heat treating, etc.

WHEELOCK, LOVEJOY & COMPANY, INC.

AMERICAN STEEL WAREHOUSE ASS'N

136 Sidney Street, Cambridge 39, Mass.

AGENTS: Southern Engineering Company, Charlotte, N. C.; Sanderson-Newbould, Ltd., Montreal & Toronto

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

buletin, (form ESA-244) illustrates and describes features of new Double XX depressed center wheel for weld grinding and general offhand use on portable disk sanders and right angle grinders.

8 CUTTING TOOLS—*Craig Tools, Inc, 133 Lomita St, El Segundo, Calif.* 6-page catalog covers Specialty HSS and carbide cutting tools. Describes standard HSS combination drill countersinks, stop countersinks, rivet shavers, back spotfacers and countersinks, many of which were not previously catalogued as standard.

9 SLIDE FEED—*US Tool Co, Ampere, NJ.* Illustrated bulletin 151 gives details on redesigned unit for automatic feeding of stock into punchpresses, even on short run jobs. Driving eccentric is adjusted to bring a pointer on the feed block over the required feed length as indicated on a scale attached to the feed body.

10 BACTERIAL INHIBITOR—*Eli Lilly & Co, Agricultural & Industrial Products Div, Indianapolis 6, Ind.* Folder describes properties and uses of Elcide 75; reported to extend the life of soluble oil emulsions as much as five and a half times that of emulsions with no inhibitor. Technical data included.

11 PRECISION SORTER — *US Engineering Co, 40-26½ 22nd St, Long Island City, NY.* Bulletin B-35 contains information on unit that gages and sorts up to 300,000 parts per hr.

12 SLIDE RULES—*Keuffel & Esser Co, Adams & Third Sts, Hoboken, NJ.* 24-page illustrated booklet gives pointers for proper selection. Discusses slide rule scale designs and arrangements; describes wide variety of K&E rules including the Log Log Duplex Decitrig, Polyphase and Mannheim types, and special purpose models.

13 TEMPERATURE SENSING DEVICE — *Robertshaw-Fulton Controls Co, Bridgeport Thermostat Div, Milford, Conn.* Bulletin describes advantages of diaphragm temperature sensors, preassembled and ready for mounting.

14 PRESS BRAKE DIES—*Dreis & Krump Manufacturing Co, 7400 S Loomis Blvd, Chicago 36, Ill.* Illustrated bulletin AFD-958 describes Chicago Alloy-Form Dies for bending and forming the various alloy sheets and plates used in aircraft, missiles, rockets, and other fabrications. Dies will fit any make of press brake.

15 TONG TEST AMMETERS—*Columbia Electric Mfg Co, 4519 Hamilton Ave, Cleveland 14, Ohio.* 8-page catalog pictures and discusses eight types of instruments and provides information on selection, ordering, and use. These clamp-type units measure both ac and dc.

16 AUTOMATIC ASSEMBLER—*Dixon Automatic Tool, Inc, 2300 23rd Ave, Rockford, Ill.* 4-page bulletin AP-B2 presents illustrated description of improved Auto-Positioner for placing and assembly of small piece parts. Various models and arrangements discussed; examples of parts being handled by the new parts feeder are pictured.

HEAT TREATING AND WELDING

17 FURNACES — *Sunbeam Equipment Corp, 180 Mercer St, Meadville, Penna.* 6-page bulletin illustrates complete range of units for wide variety of applications. Heat treating processes and appli-

cable furnace and protective atmosphere types presented in tabular form.

18 HEAT TREATING FURNACE—*C I Hayes, Inc, 810 Wellington Ave, Cranston 10, RI.* Illustrated bulletin 5709A describes design features of Model HT/HV vacuum furnace designed for production heat treating of exotic refractory metals requiring temperatures of 3000 F plus. Lists typical applications, gives complete performance data.

PLANT SERVICE EQUIPMENT

19 PRECISION FINISHING — *Lord Chemical Corp, 2068 S Queen St, York, Penna.* 12-page bulletin 258 illustrates and describes the Loreo Vibrator that incorporates three-way vibratory action. Both amplitude and frequency of vibration can be varied to fit wide range of requirements. Units are available with tilting bowls for discharge or designed for completely automated conveyor-line production. Large and complex parts or extremely small parts may be handled.

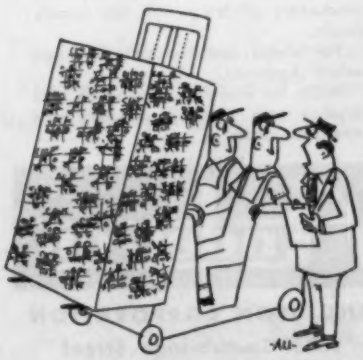
20 SAFETY EQUIPMENT — *Chicago Eye Shield Co, 2727 W Roscoe St, Chicago 18, Ill.* 48-page catalog covers selection, application, and maintenance of protective equipment for hundreds of individual industrial applications. Detailed chart lists recommended protection for 17 basic classifications of industrial hazards. Includes product descriptions of all items in Cesco line.

21 STORAGE RACKS—*Chicago Tramrail Corp, 1330 S Kostner Ave, Chicago 23, Ill.* 12-page bulletin R-400 illustrates and describes wide variety of racks. Includes application drawings and diagrams.

22 COLD CLEANING SOLVENT—*Du Pont Co, Chlorine Products Section, Electrochemicals Dept, Wilmington 98, Del.* 4-page technical report evaluates the relative safety of solvents used in cold cleaning of metal parts. Report establishes a new concept of a relative safety index for solvent evaluation based on maximum allowable concentration, vapor pressure, and evaporation rate of the solvents.

23 DIP AND RINSE TANKS—*Wheelabrator Corp, Techline Div, 1140 Avenue V, Vicksburg, Mich.* Bulletin 400 contains information on four standard models of all-steel equipment for precision finishing processes. Two water tanks and two oil tanks are illustrated, both 24 in. deep, 24 in. long, 16 in. wide, 40-gal max capacity.

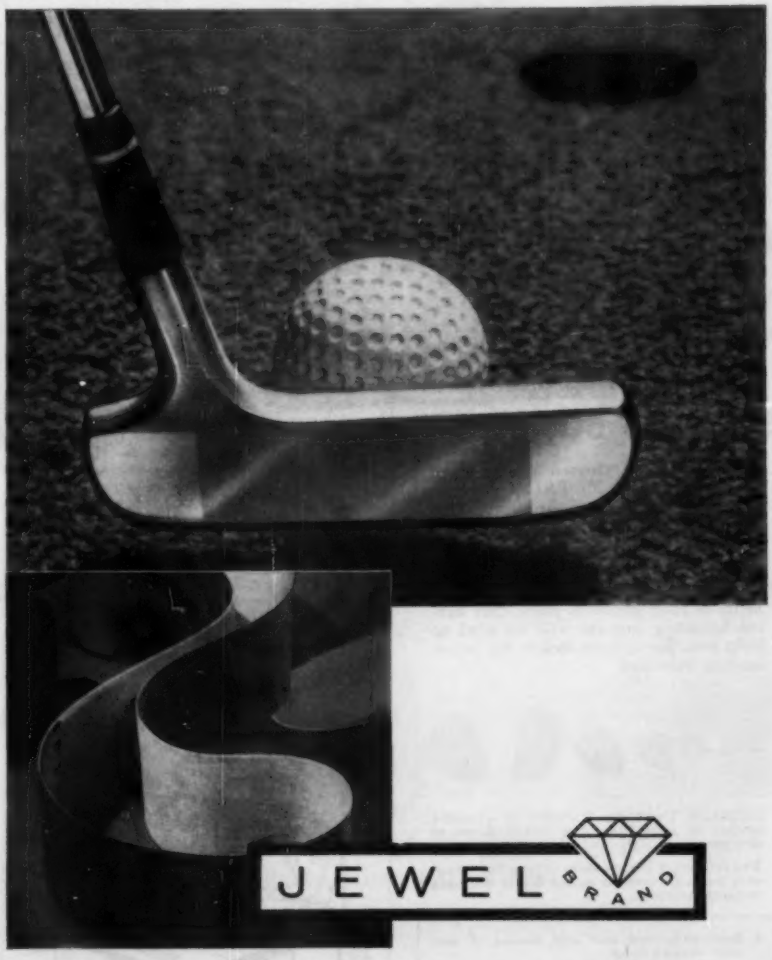
24 HERMAN NELSON HEATING COILS—*American Air Filter Co, 215 Central Ave, Louisville, Ky.* 80-page bulletin 890 illustrates and describes complete line. Contains coil selection information as



"What took so long?"

For the finishing touch that means so much!

Whether you're polishing the business end of a stainless steel golf club or smoothing out the rough spots in precision instrument parts, Jewel Brand Coated Abrasives ensure faster, finer finishing. On job after job, experience proves that **end products cost less when you finish with Jewel Brand Abrasives.** Prove it for yourself now, by bringing their many money-saving advantages to bear on your own finishing problems. Order from your Industrial Distributor or write for specific recommendations. Abrasive Products, Inc., 561 Pearl Street, South Braintree 85, Mass.



COATED ABRASIVES

Belts • Rolls • Sheets • Discs • Specialties

ABRASIVE PRODUCTS, INC.

South Braintree 85, Massachusetts

Barrel Finishing with EXOLON

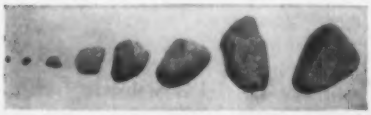
gives you control of stock removal

Replaces slow, costly, hand finishing methods

SAVINGS 50 to 80%

Precision parts shown above were barrel finished with EXOLON to a predetermined stock removal and finish. Results were always the same, batch after batch, because formulated finishing cycles were strictly adhered to.

Send us your problem parts. Our barrel finishing experts will be glad to help you. See coupon below for information required.



EXOLON Tumbling Abrasive is carefully graded in sizes from 2½ inches down to fine powders.

The following information is required whenever parts are sent to us for barrel finishing recommendations.

1. Send unfinished part and sample of part with desired finish.
2. Describe present finishing procedure.
3. List all special requirements.
4. Daily production required.

Name.....

Company Name.....

Address.....

The EXOLON Company
845 East Niagara Street, Tonawanda, N.Y.
Thorold, Ontario, Canada

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

well as detailed descriptive data on coils themselves. Includes construction specifications, dimensional data, surface charts, circuiting and piping diagrams. Coils covered are standard steam, steam distributing, and hot water.

25 ULTRASONIC CLEANING—*Branson Ultrasonic Corp, 40 Brown House Rd, Stamford, Conn.* First issue of Branson Ultrasonic News, literature specializing in industrial techniques and applications of inaudible sound, features role of ultrasonic cleaning in cutting rejects at several stages in manufacturing silicon diodes. Automated ultrasonic inspection and materials control also covered.

PARTS AND MATERIALS

26 STRESSPROOF STEEL BARS—*La Salle Steel Co, PO Box 6800-A, Chicago 80, Ill.* 4-page bulletin points up recent improvements in manufacturers' high-strength, free-machining bars. Physical properties compare with those obtained by heat treating, without necessity for heat treating, plus machinability 50-100% faster than equivalently hardened alloy steels.

27 HYDRAULIC CYLINDERS — *Milwaukee Cylinder Co, Div of L & M Machine Co, 5757 S Pennsylvania Ave, Cudahy 7, Wis.* Two bulletins, No. H-100 on Series 'h' hydraulic units (2000 to 3000 psi, 1½ to 12-in. bore) and No. A-100 on Series 'a' heavy-duty air cylinders (200 psi, 1½ to 14-in. bore) illustrate and describe applications and features.

28 FLEXIBLE METAL HOSE CONNECTORS—*Cobra Metal Hose, 5059 S Kedzie Ave, Chicago 32, Ill.* 16-page catalog and price list 658 gives data on complete selection of standard units including recently introduced line of wet heat connectors. Standard connectors are listed from ¼-in. ID on the flexible nipples to 8 in. ID on the pump connectors, with or without braided wire sleeve, depending on working pressures to be used.

29 SOCKET SCREW PRODUCTS—*Set Screw & Mfg Co, Bartlett, Ill.* 28-page illustrated catalog 23 contains technical and dimensional information on complete line including the new Setko socket shoulder screws, flat heads, button heads, and dowel pins. Self-Locking Set

(Continued on page 170)

"Remember . . . keep your mouth shut in the presence of wives, foremen, and hot chips."

A FREE COST-CUTTING CONSULTANT

Your local Industrial Distributor has gained wide experience in serving many industries and in providing solutions to a variety of production problems. His service begins with an idea — a cost-cutting idea in the form of a product or method which he is willing to suggest at no charge to you.

A COST-CUTTING TOOL

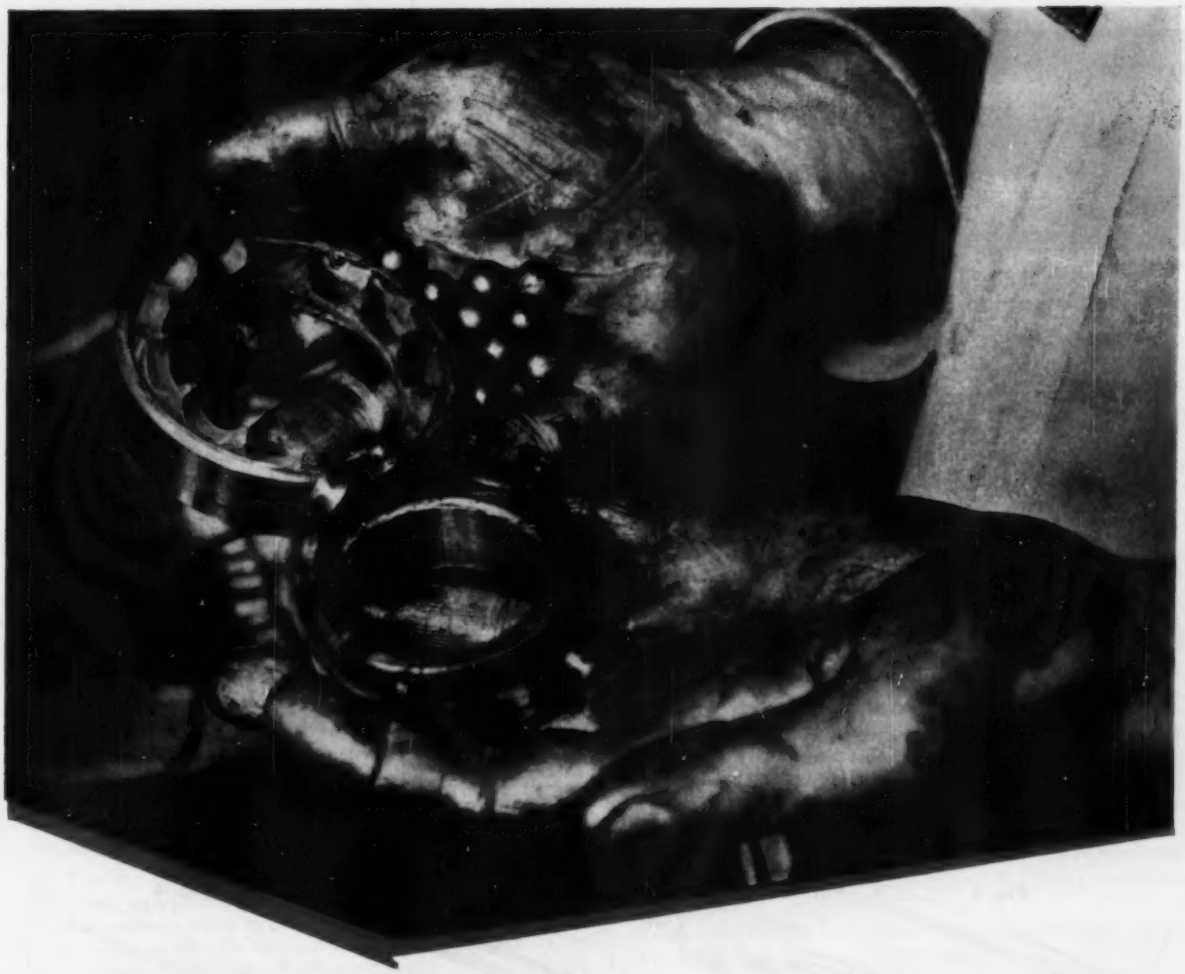
He frequently recommends Anderson wire brushes for those jobs requiring production efficiency with top quality results.

For lowest cost per unit processed select: Anderson.

Write for complete catalog of wire brushes with detailed selection and operation data.

Anderson

ANDERSON CORPORATION
1056 Southbridge Street
Worcester 10, Mass.



When bearings must be replaced . . . "almost the same" is always wrong!

There is a difference in precision, fit-up and clearance of bearings carrying the same part number and Bearings, Inc. experts know which bearing will give you longer service life on any application.

This knowledge, plus the immediate availability of all types of bearings used by industry, guarantees that you get the bearing best for each application! They will be "factory fresh". . . incorporating the latest design and manufacturing advancements.

If in doubt about the proper specifications for a bearing application, contact the Bearings, Inc. engineer in your area — he'll be glad to make recommendations that are right all the way.

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NEW YORK: Buffalo, Bolanrol Corp. • **MARYLAND:** Baltimore • **DELAWARE:** Wilmington

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FLORIDA: Jacksonville • **GEORGIA:** Atlanta • **KENTUCKY:** Louisville • **LOUISIANA:** Baton Rouge • New Orleans
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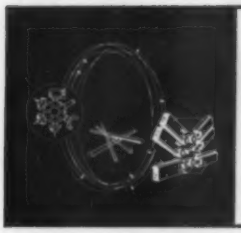


MACHINING ALUMINUM

OPERATOR REPORTS

This report is one of a series by Deo Blott, Technical Specialist, Kaiser Aluminum & Chemical Sales, Inc.

Tapping aluminum on automatic screw machines

HIGH SPEED STEEL TAPS are generally recommended for automatic screw machine work. Carbon steel taps can be used for hand tapping. Although standard taps are commonly used for tapping aluminum alloys, special taps ground for aluminum will often give better results.

Tap Design and Grinding

Spiral-fluted taps are sometimes used to draw the chips out of deep or blind holes, and are especially useful when tapping aluminum (as shown in Fig. 1). Taps for aluminum should have ground threads with deep, wide and polished flutes. Hook and rake angles should include the first full tooth.

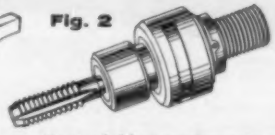
Where conditions are poor for rigid alignment of tap and work with advance of tap matched to lead or pitch, floating holders are sometimes used to avoid oversize holes, breakage, or excessive tap wear. The holder should be able to float both angularly and at right angles to its axis to avoid a tendency to cramp work or tap (as shown in Fig. 2).

Most regular stock taps are ground with 5 degree rake, but for best results with aluminum alloys, the cut-

Fig. 1

Spiral fluted tap for tapping aluminum

Fig. 2



Floating holder overcomes poor alignment conditions

Fig. 3

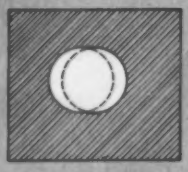
Lip hook on straight flute tap increases rake

Fig. 4

Fluteless tap internally rolls threads

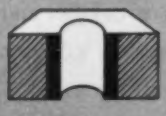
Fig. 5 FAULTY DRILLING PRACTICES CAUSE TAPPING FAILURES

DRILLING FAULT



Improperly ground drill makes an egg-shaped or out-of-round hole.

Inadequate hole diameter, over 75% depth of thread.



Dull drill causes surface of hole to work harden.

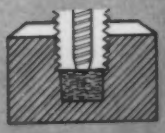
Chips from drilling left in bottom of hole.

CONSEQUENCES

Threads will be of uneven depth; they may not extend across the hole if egg-shape is excessive.

Tap likely to break; more power necessary; tendency to ream instead of thread.

Tap has trouble starting; threads may chip or round over; breakage likely.



Breakage may result when tap reaches packed chips.

ting face should be ground with 10 to 20 degrees rake or hook. This can be obtained on straight flute taps by grinding a lip hook into the end of the tap, (as shown in Fig. 3) and should include the chamfer and first full thread. This hook will sometimes force chips ahead of tap, which may be objectionable on some screw machine jobs.

Figure 4 illustrates a fluteless tap which cold forms internal threads. Threads are formed in the metal under pressure. The grain fibers follow the contour of the threads and are not cut away.

Tapping Operation and Practices

The sizes of drilled holes are especially important when close tolerance is a factor (see Fig. 5).

If the hole is too small, the tap must remove an undue amount of solid stock in addition to cutting the threads. This can produce a rough thread, excessive tool dulling, or breakage.

If the hole is too large, the holding power of the thread will be greatly lessened because of the shallowness of the threads. Seventy-five per cent of full is considered sufficient for most requirements. Undue strain on the tap is avoided and the holding power of the threads is near that of full threads. Standards have been established for tap drill sizes that will produce threads from 62 per cent to 81 per cent full, depending on the pitch and diameter of the thread and tap.

If, due to unusual requirements, specifications for minor diameters of tapped holes are especially exacting, it may be impractical to hold tolerances with a tap drill alone. Reaming may then be necessary. In such case, the tap drill should be from 0.006 to 0.012 inch smaller than the tap diameter.

If a tap is cutting too small, grinding more rake on the cutting edges will often help. Resharpening without any change in form helps to a lesser degree. A dull tap cuts closer to size than a sharp one. If the chamfer relief is increased, it enlarges the hole; this also happens if the lands on the chamfer portion are ground to unequal heights.

The speed at which taps can be efficiently operated depends on a number of variables, such as composition and hardness of the material to be tapped, depth of hole, type and condition of machine used for tapping and the cutting fluid used. For these reasons, tapping speeds given below should be taken as general guides and not as hard-and-fast rules:

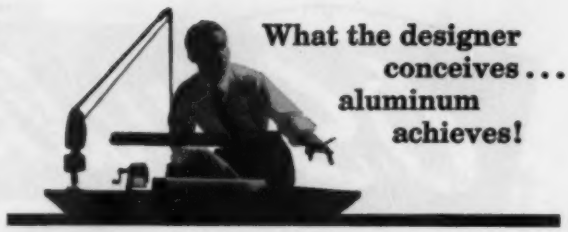
3 to 8 threads per inch . .	50 to 75 SFPM
9 to 15 threads per inch . .	90 to 125 SFPM
16 to 24 threads per inch . .	125 to 150 SFPM
25 and finer	150 to 200 SFPM

* * * *

The tooling information presented above was condensed by Deo Blott from Kaiser Aluminum's library of helpful screw machine information. This information is available to screw machine operators upon request.

And to further help you machine aluminum effectively, Mr. Blott will go to your shop to recommend practices proved best by operators experienced in aluminum.

For full details of Kaiser Aluminum customer services available to you, and for your complete set of the informative "Operator Reports" series, call your local Kaiser Aluminum representative or write: Kaiser Aluminum & Chemical Sales, Inc., 919 N. Michigan Ave., Chicago 11, Ill.



What the designer conceives . . . aluminum achieves!

How Kaiser Aluminum "Designer Series" ads are helping to build business for you!

These six words—"what the designer conceives, aluminum achieves"—are the theme for a complete advertising campaign directed to parts designers. The campaign is helping persuade them to *specify aluminum* in screw machine parts.

You can take advantage of their growing interest by presenting to *your* customers the same advantages of aluminum in screw machine production that Kaiser Aluminum is presenting to designers (below):

(1.) Why Design Parts For Screw Machine Production?

1. Starting material is a wrought product which gives high properties in the finished part.
2. Excellent finishing possibilities.
3. Closer tolerances and more intricate parts possible.
4. Very fine threads possible.
5. Excellent concentricity is guaranteed.
6. Fewer rejects for porosity.
7. Fewer secondary operations necessary.
8. Modification of parts in production easier and less costly.
9. Wide range of equipment and facilities available throughout the country.
10. Lower costs for production tooling, dies, set-up.
11. Lower costs for actual production.
12. Lower costs for finished parts.

(2.) Why Design For Production In Aluminum?

1. Light weight—moving parts present less resistance to applied force, wear less; chips float out of recesses better for cleaning finished parts.
2. Greater conductivity.
3. Corrosion resistant.
4. Non-sparking.
5. Non-magnetic.
6. Lower raw material cost per part.
7. Less price fluctuation on raw materials.
8. Some alloys less susceptible to radiation absorption.
9. More alloys available than some other metals.
10. Stock readily available.
11. Easy machining, with resulting greater tool life.
12. Technical literature for designing purposes readily available.

KAISER ALUMINUM

THE BRIGHT STAR OF METALS

O.S.Walker

NEW 12"x24"

Permanent Magnetic Chuck

This new, large chuck from O.S.Walker gives you the greatest chuck capacity ever... 12 x 24 inches! Like other O.S.W. permanent ceramic magnetic chucks,* the new 1224 chuck has the most permanent magnets ever produced. They're *ceramic*, with many times the coercive force of alloy magnets. The face is *all steel*, with *no* soft insulating material.

Other important features include: low, low height, for extra machine capacity; fine pole divisions for maximum holding power; new, extremely stable "Niresist" body for greater rigidity.

All magnetic fields are controlled to prevent magnetization of the machine table or ways, as well as cutting tools. This feature, especially, makes the O. S. Walker 1224 Chuck ideal for milling and planing operations.

For details, call your local dealer or direct to O. S. Walker.

*Patent applied for

O. S. WALKER COMPANY, INC.

WORCESTER 6, MASSACHUSETTS, U. S. A.

The Original Designers and Builders of Magnetic Chucks

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

Screw selector chart presents 1000 combinations of metals, locking actions, points, and suggested applications.

30 STEEL CHART — *Uddeholm Co of America, 155 East 44th St, New York 17, NY.* Chart lists comparable brand names of 13 major tool steel suppliers and classifies, by general type and SAE number, 16 different grades. Listed vertically, under each company name, are the brands of that company in each SAE classification. Listed horizontally, next to individual grades, are the brand names available in that grade from the company.

31 MOTORIZED GEAR DRIVES — *Louis Allis Co, 427 E Stewart St, Milwaukee 1, Wis.* 4-page bulletin 2350 contains data on Line-A-Spede drives that are gear reducers powered by standard NEMA frame motors mounted on a shelf attached to the reducer. Construction features illustrated, engineering specifications and dimensions given. Drives use double, triple, and quadruple reduction units for ratios up to 1487 to 1 with motor ratings of 1 to 75 hp.

32 ALLOY POWDER—*Republic Steel Corp, 1441 Republic Bldg, Cleveland 1, Ohio.* 14-page bulletin 1028 gives complete technical data on HS 6460 including properties, specifications, and heat treating recommendations. Powder is designed for use in higher stressed parts produced with existing operating equipment and provides high strength with lower cost.

33 FREE MACHINING AIR HARDENING DIE STEEL — *Allegheny Ludlum Steel Corp, Oliver Bldg, Pittsburgh 22, Penna.* 4-page Blue Sheet on Sagamore-EZ describes the steel as applicable to blanking and forming punches, dies and rolls; trimmer dies, cold or hot; plastic molding dies; straightening and bending dies; and gages. Material is a 5% chromium steel with uniformly distributed sulfide particles which impart improved machining characteristics.

34 AIRCRAFT LOCKNUTS—*Standard Pressed Steel Co, Jenkintown, Penna.* 4-page illustrated bulletin provides information on the FN-12, said to permit weight savings to 72%. Tensile strength of the cold forged nuts is in excess of 125,000 psi. Tables compare weights with other locknuts, in current sizes from No. 4-40 to ⅜-24.

"All those opposed, signify by saying, 'I quit'."

FIELD REPORT...

Sundstrand Acquires Packmaster

Design, manufacturing, and sales rights to the line of Packmaster automatic packaging machinery have been acquired by Sundstrand Machine Tool Co, Rockford, Ill. Machines pack hardware, strip trim, spare parts, and similar items in flat or dome enclosures. Sundstrand-Packmaster units will be built and sold through the company's American Broach Division, Ann Arbor, Mich.

Clark Equipment to Build

Clark will build a factory in Michigan City, Ind, to manufacture truck trailers of its Brown Trailer Division. Division, with plants in Spokane and Reading, Penna, will locate its headquarters at the new facility, scheduled for completion next May.

Hall-Scott Diversifying

The Berkeley, Calif, firm which recently sold its engine manufacturing operation and its electronics division has decided to branch out into the chemical industry. Company has bought half interest in DuBois Co, Cincinnati manufacturer and distributor of soap and detergent compounds. DuBois has plants in Ohio, Texas, California, and New Jersey; annual sales run into eight figures.

$16 Million Contract to Hughes

Hughes Aircraft has an AF contract for production of an additional 34 of the MA-1 aircraft and weapons control systems for the F-106 jet interceptor. Company is currently producing the electronic systems at its El Segundo, Calif, plant.

Bethlehem Ship Order

Bethlehem Steel Co has received a contract from the Lykes Bros Steamship Co and the Maritime Administration to build four new merchant vessels. Ships will cost $9,172,000 each.

Ransburg's New Facility

Ransburg Electro-Coating Corp has moved into its new building northwest of the Indianapolis city limits. Facility is part of a $1.5 million expansion and building program. Some 18,000 sq-ft of the 80,000 sq-ft plant are taken up by engineering and laboratory testing facilities. Sixteen conveyorized demonstration laboratories are available for test-painting

SHELDON Precision LATHES

for the size Lathes

You Need Most

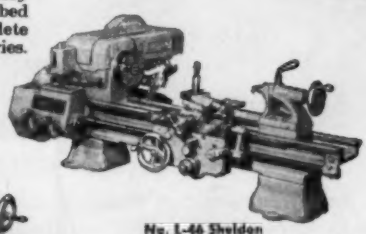
Sheldon lathes are built in the sizes you need most, for toolroom and production jobs. They are available with swings of 10", 11" and 13"... in varying bed lengths with 18" to 48" center distances . . . and . . . in your choice of pedestal, cabinet or bench mountings.

Powerful, all-V-belt, drive units – either the standard 8-speed (or 16-speed) E-drive; or the production favorite, a rapid, lever-shift U-drive. Where higher spindle speeds are desired, the standard E-drive can be built to provide speeds up to 2,000 r.p.m.

All Sheldon Lathes have handscraped, built-in precision. Each lathe is guaranteed to meet or surpass the American Standards for Toolroom Accuracy. With every Sheldon Lathe goes a copy of the accuracy tests actually performed on that lathe. (19 checks).

Important optional features include: hardened bed ways, L00 Long Taper Key Drive spindles, 4" D1 Camlock spindles, bed turrets, taper attachments and a complete line of toolroom and production accessories.

UM-56 P
13" Swing
Precision Lathe

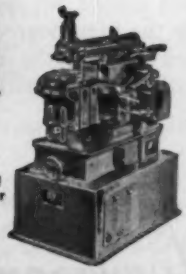


No. L-46 Sheldon
10" Precision Lathe

Sheldon-Built
Sebastian 13" and 15" Geared Head
Precision Lathes

The new Sheldon-built Sebastian Geared Head Lathes have greatly increased work capacity and many advanced features. These include a wide, heavy, hardened and ground bed . . . easy shifting spindle speed dial . . . 60-pitch gear box . . . independent drop lever apron clutches . . . cam-action tailstock clamp . . . and, automatic lubrication in the headstock and apron with "1-shot" lubrication of carriage.

SHELDON
Horizontal
Milling Machine



SHELDON
12" Shaper

Send in coupon or write for catalogs and names of nearest Sheldon and Sebastian Distributors where you can see these new lathes in operation.

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4234 North Knox Avenue, Chicago 41, Illinois

Gentlemen: Please send new catalogs describing:
☐ Sheldon ☐ 10", ☐ 11" ☐ 13" Lathes
☐ Sebastian 13" and 15" Geared Head Lathes
☐ Horizontal Milling Machine ☐ Name of Local Dealer
☐ Sheldon 12" Shaper ☐ Have representative Call

Name ..... Title .....
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Street Address ..... ☐ Company ☐ Home
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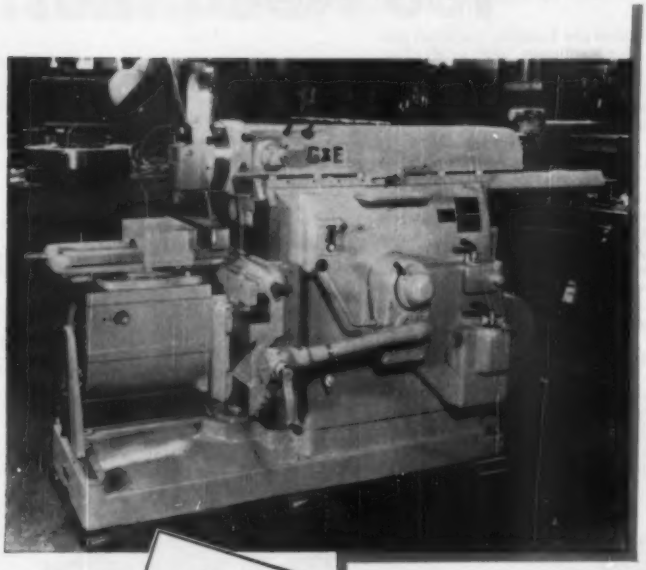
4234 N. KNOX AVE. • CHICAGO 41, ILLINOIS

Can You Hold Your Shaper Without Bolts?

YES- with new WEDGMOUNT which anchors Shapers, Presses, etc. *and* permits precision leveling!



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WEDGMOUNT with—

"Air-Loc" patented vinyl, sisal and cork pads top and bottom grip machines to floors

•

double-wedge construction which permits immediate precision leveling

•

keyed construction which prevents movement within the mount

•

sizes available thru distributors, and prices

This Gould & Eberhardt 24" Industrial Universal Shaper, operating at 120 cuts per minute with a 4" stroke, is installed without bolts on a new type machinery mount called WEDGMOUNT. A dial indicator at the base of the shaper showed a total oscillation of only .022" during operation, and no "walking." The 7,800 lb. machine is installed on six WEDGMOUNTS, each type 3" x 6" S. Before operation, precision leveling is achieved by simple adjustment of a bolt within each mount. Top and bottom of each mount is surfaced with patented "Air-Loc" pads, which provide the high degree of friction required to hold the machine in place despite its strong lateral thrust.

Air-Loc® WEDGMOUNT

write to... **Clark-Cutler-McDermott Co.**

100 West Central Street • Franklin • Massachusetts

Field Report . . .

small articles as well as products the size of an automobile body. Electrostatic processes can be demonstrated in any of the labs which most closely simulates the customer's production facilities. Additional technical facilities include the automatic equipment manufacturing area; a machine and welding shop, and a conference room set up with movie projection equipment. Back part of the plant includes paint mixing and stripping rooms, plus storage space for articles and products sent into the plant for lab demonstrations.

General Electric Plans . . .

. . . to spend $47 million during the next five years to modernize its facilities at Pittsfield, Mass.

Buick Recalls More Workers

Buick Motor Division has recalled an additional 600 seniority employees on top of the 3300 it announced early last month. Company plans a second shift in its assembly plant. Earlier recall was to second-shift all production plants except assembly.

Container Corp of America . . .

. . . plans to put up a $1 million converter plant at Brewton, Ala, next to its $30-million paperboard mill there. It'll employ 200 workers. Company has also ordered $250,000 worth of machinery for its Chattanooga, Tenn, plant where a 30,000 sq-ft addition will be built next year.

Hoover Ball & Bearing Forming New Subsidiary

Company is establishing Hoover International, Inc, a wholly owned subsidiary, and has acquired a substantial interest in Nishi Nippon Seiko (NSK) of Otsu, Japan. NSK is the largest bearing company in Japan. Under the terms of acquisition it'll manufacture bearings to Hoover specifications under the supervision of Hoover engineers now there. Arrangement also specifies that Hoover will have exclusive rights to market all products made by NSK on a world-wide basis, except for Japan.

New North Carolina Company

Woodward Co, Owosso, Mich, is putting up a 33,000 sq-ft plant at Salisbury for the manufacture of wrought iron furniture. Production will get underway late this year.

Howard's Fourth Motor Line

Howard Industries of Racine, Wis, has purchased a complete line of precision motors from McGraw-Edison Co. Equipment purchased to manufacture the line (many are aircraft approved) is being installed at the Racine plant. This is the fourth new motor line acquired by Howard within a year. Late last year the company purchased the Universal Motor Division of Westinghouse Electric; last March it took over the physical assets, business, and name of the Loyd Scruggs Co, Festus, Mo, and in September it acquired an induction motor line from Westinghouse.

Capewell Opens Chicago Operation

Capewell Manufacturing Co, Hartford, Conn, has opened new office and warehouse facilities in Chicago. Complete stocks of company's products including hand and power hacksaws, hole and bandsaws, hammers, and ground flat steel will be available.

$22 Million Order to Burroughs

Burroughs Corp, Detroit, has a $22.8 million contract for additional 32 data processing systems used in the SAGE system of air defense. Latest order brings to 98 the number of data processing systems that company has contracted to build and approximately $112.8 million in contracts in its SAGE program. Work includes equipment, installation, technical data, and personnel training.

(continued on page 176)

"That boy will be vice president some day. He makes $150 a week by raffling off his $20 pay check."

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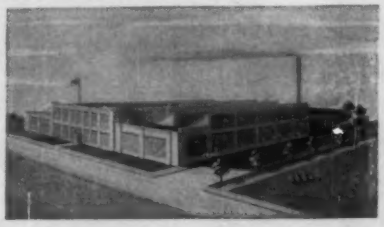
CDT CAN INCREASE YOUR PRODUCTION
. . . because CDT specializes in designing and building tools and machines for today's high production demands.

CDT CAN IMPROVE YOUR QUALITY
. . . because CDT tools, jigs, fixtures and machines are precision engineered and built to the strictest requirements.

CDT CAN LOWER YOUR PRODUCTION COSTS
. . . by increasing the efficiency of your operation with special tools that do the job better—faster—more economically.

Call on Columbus Die-Tool for your special tooling problems. A large creative engineering staff with experience in developing special tools and machines for hundreds of industries is at your service. Over 50,000 square feet filled with precision production equipment enables us to build fine tools and special purpose machines to exacting requirements. Avail yourself of the industry-wide experience of Columbus Die-Tool.



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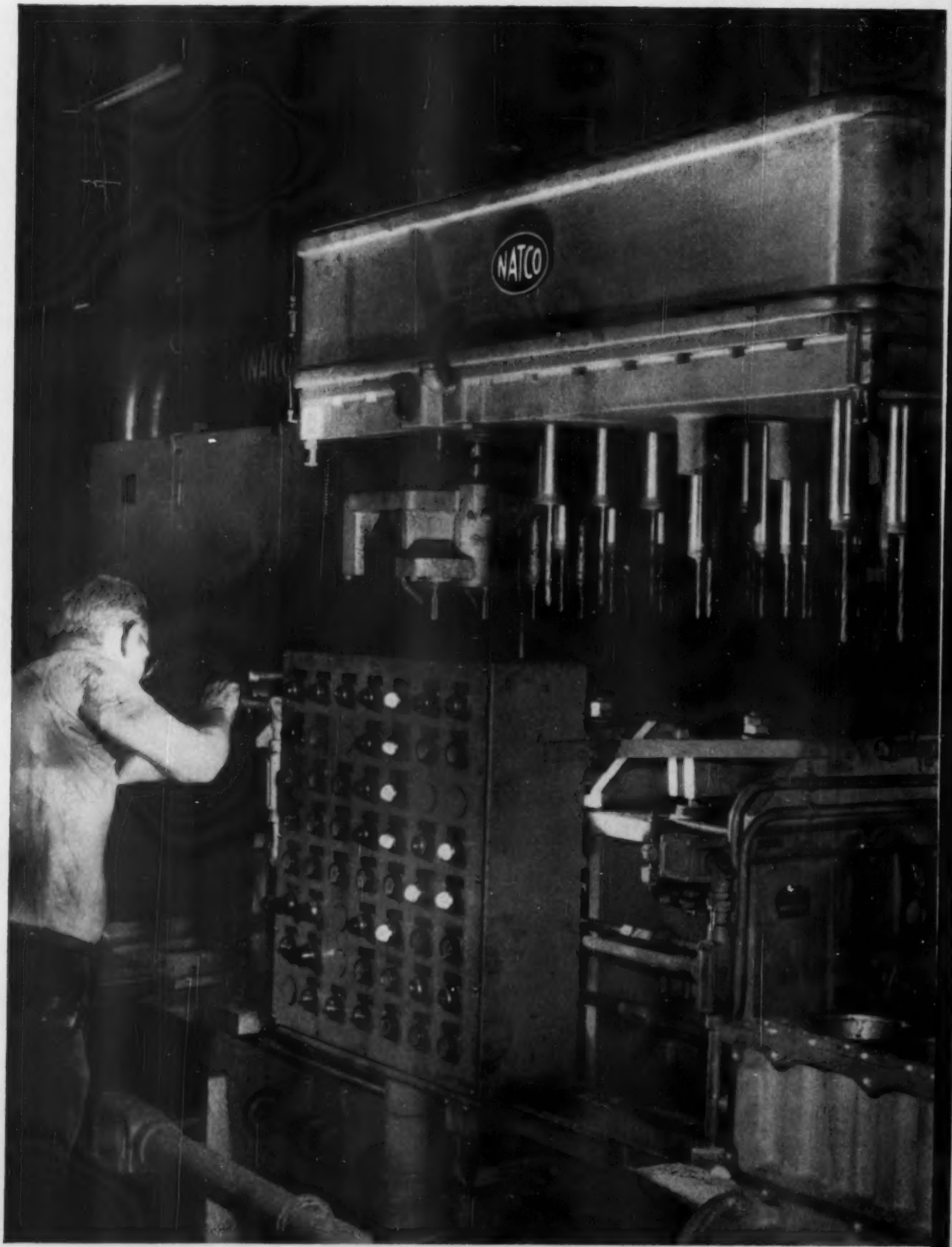
Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*


NATCO

Unique Natco Transfer Machine

One head does the work of four

New Static Control saves space, maintenance

Although it takes up only 125 sq. ft. of floor space, this Natco performs more than 36 operations per minute!

This unique machine combines four working stations under a single compact head — 32″ x 57″, incorporating 31 spindles. Fixture is Natco 6-station straight line index type. With a part in each station, the following operations are accomplished simultaneously:

Station 1: Load Station 2: Drill 7 holes Station 3: Drill 5 holes Station 4: Chamfer 7 holes, drill 5 holes Station 5: Tap 7 holes Station 6: Unload

Used for the first time in a transfer machine, static controls provide a new degree of reliability. Because there are no moving parts, maintenance is virtually eliminated. And this panel occupies 30% less space than conventional controls require.

Combining operations leads to economy — in this case, saved floor space, easier maintenance and all the advantages automation offers.

Call your nearby Natco representative. He can tell you how a Natco can reduce your costs, improve your methods.

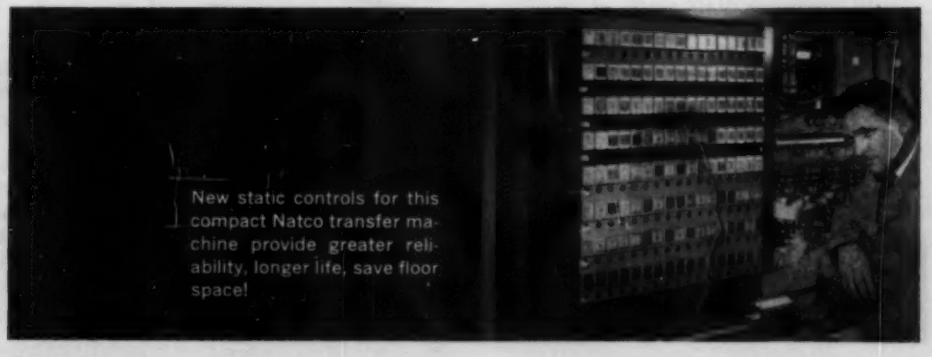
Multiple-spindle drilling, boring, facing and tapping machines. Special machines for automatic production.

NATIONAL AUTOMATIC TOOL COMPANY, INC.

Dept. 305-A, Richmond, Indiana

Natco offices in Chicago, Detroit, Buffalo, New York, Boston, Philadelphia, Cleveland and Los Angeles. Distributors in other cities.

NATCO



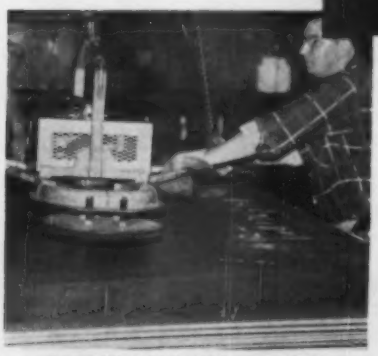
New static controls for this compact Natco transfer machine provide greater reliability, longer life, save floor space!

DON'T MISS THE BOAT . . .

VAC-U-MATION®

is TODAY'S safer and more economical way to handle SHEETS and BLANKS*

Two views of 4-cup VAC-U-MATION Lifter showing 2600 lb. steel plate in horizontal and vertical positions. In operation at a West Coast aluminum plant.



2-cup VAC-U-MATION Lifter at CATERPILLAR TRACTOR, Joliet, Illinois plant handling 500 lb. sheets on squaring press.

VAC-U-MATION shortens man-hours—cuts handling costs—pays for itself F-A-S-T. For example, a big electrical manufacturer says VAC-U-MATION has cut a three-man hazardous chore of unstacking and cutting metal sheets weighing up to 400 lbs. each to a safe, efficient one-man operation.

VAC-U-MATION is growing up. Why not look into it for your sheet and blank handling?

*STEEL, ALUMINUM, GLASS, WOOD, etc.

4581C

14" diameter waffle-faced cup with neoprene rubber.

Molded on steel backing plate equipped with 4 mounting holes. Other designs for 6", 8" and 10" diameters available.

20" square waffle-faced cup with neoprene rubber.

Molded on aluminum backing plate equipped with 4 mounting holes.

Rectangular cups with neoprene rubber molded on steel backing plate. Sizes 2½" x 8½" and 2½" x 16".

Write for NEW Catalog!

R. J. LITTELL MACHINE CO.

VAC-U-MATION DIVISION

4103 Ravenswood Avenue, Chicago 13, Illinois

District Offices Detroit and Cleveland

Field Report . . .

Sikorsky Reducing Work Force

Declining production schedules will force Sikorsky Aircraft Division of United Aircraft Corp to cut its work force by some 1100 employees between now and the first of April. Decrease will affect salaried and hourly workers at the company's plants in Stratford and Bridgeport, Conn, and will reduce the division's total employment to 8400. Transition from piston-engine to turbine-engine powered helicopters is a major factor in cutback. Newer copter developments such as the S-60 flying crane and the turbine powered S-61 and S-62 are expected to pick up the slack in production eventually.

Westinghouse to Build Nuclear Machinery

Westinghouse Electric Corp has a contract for an undisclosed amount from General Dynamics Corp to develop the rotating machinery for a marine nuclear power plant. Project, sponsored jointly by the US Atomic Energy Commission and the Marine Administration of the Dept of Commerce, is directed toward development of a nuclear propulsion plant for merchant ships using a gas-cooled nuclear reactor. Contract, covering design and development work, will be carried out principally by the industrial gas turbine department at the steam division in Lester, Penna.

US Drill Head Expands

United States Drill Co of Cincinnati has completed the second phase of its three - quarter - million - dollar building program with the opening of an 11,000 sq-ft structure to house the Standard Pattern Division. First unit on the 13-acre site was the company's aluminum, brass, and bronze foundry. Ground will be broken soon for the third facility, a 45,000-sq-ft building for the Machine Tool Division.

Checker Passenger Car . . .

. . . will be similar in design to the company's new taxicabs, except that it will have a 6-cylinder overhead valve engine instead of the taxis' L-head engine. The car will not be manufactured at Kalamazoo—just assembled there—and the engines are being built by Continental Motors, Muskegon, Mich. Checker expects to sell 15,000 to 20,000 of the cars a year.

Jig and Fixture Makers Unite

New national trade organization, National Institute of Jig and Fixture Component Manufacturers, has been formed. Companies participating include the principal manufacturers in the US. Erick W Bergmann, Monroe Engineering Products, Inc, is president, and John Burke, West Point Manufacturing Co, is vice president. Membership is open to all qualified companies; inquiries should be directed to Harold Wrigley, secretary-treasurer of the association, at Vlier Engineering Corp, 8900 Santa Monica Blvd, Los Angeles 46. Next semi-annual meeting is scheduled to be held in Detroit on April 20.

Ryan Firebee Contract

Air Force has ordered quantity production by Ryan Aeronautical Co, San Diego, of an advanced version of the company's remote-controlled jet target drone, the Q-2C. First phase of the program calls for expenditure of $2.4 million with full project expected to approximate $10 million. Production will extend into 1960.

Guided Missile Frigate

Navy has ordered construction of the first nuclear-powered guided missile frigate at Bethlehem Steel Co's Fore River Shipyard at Quincy, Mass. Yard is currently working on the missile cruiser Long Beach, the first atomic surface vessel.

New Blaw-Knox Branch

The Pittsburgh company will locate a new branch of its Power Piping and Sprinkler Division at Jackson, Miss. Plant will fabricate piping for refineries, chemical plants, generating plants, and similar operations.

"Personally, I prefer a boss who rants and raves when things go wrong!"

OUR CONSTANT RESEARCH PROGRAM IS YOUR BEST GUARANTEE OF QUALITY CONTROL

Let our metallurgists help select THE RIGHT STEEL for each job from WYCKOFF positively uniform COLD FINISHED STEELS

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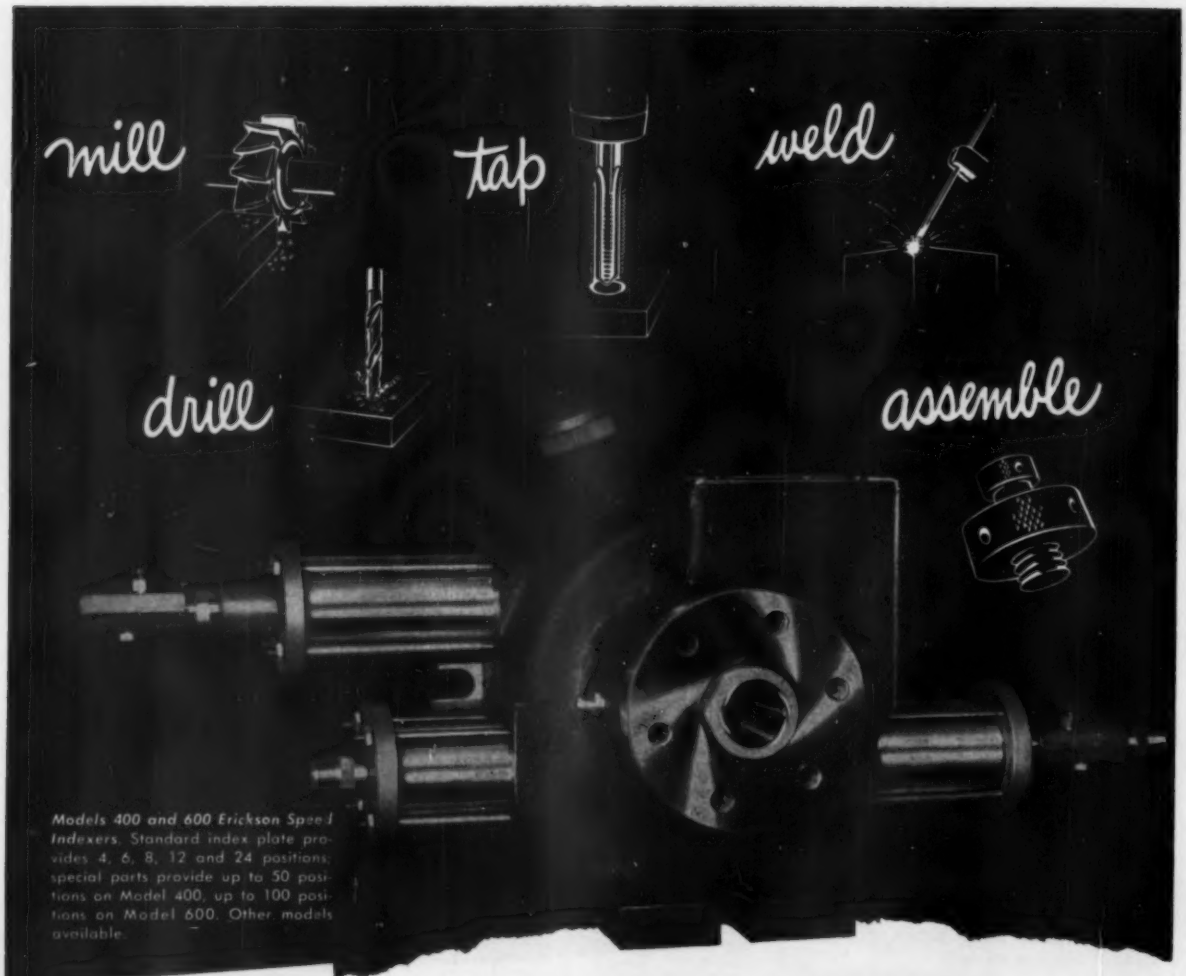
WYCKOFF STEEL PRODUCTS: Carbon, Alloy and Leaded Steels • Turned and Polished Shafting • Turned and Ground Shafting • Large Squares • Wide Flats up to 12¾" x 2¼" and 14" x 1¼" • All Types of Furnace Treated Steels



Models 400 and 600 Erickson Speed Indexers. Standard index plate provides 4, 6, 8, 12 and 24 positions; special parts provide up to 50 positions on Model 400, up to 100 positions on Model 600. Other models available.

Angular accuracy within 2 minutes... repetitive accuracy in low "tenths" of a thousandth

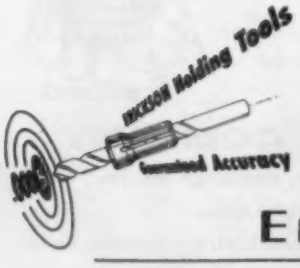
ERICKSON INDEXERS—

the economical way to smash automation bottlenecks

Even the most elaborate automatic production line can bog down *expensively* without rapid and accurate automatic parts positioning.

That's where Erickson Indexers really pay off. For you can interlock them into your production set-up with micro switches and solenoid valves. The hardened and ground lock pin operates in conjunction with the actuating mechanism to assure *positive positioning and angular accuracy within 2 minutes of a degree.* (Repetitive accuracy is no indication of angular accuracy. Erickson holds repetitive accuracy in low "tenths" of a thousandth.) And Erickson Indexers can maintain this great accuracy because their adjustable, self-contained shock control unit delivers a cushioned rotary load to the mechanism, thereby reducing wear.

Speed to keep lines moving . . . accuracy to reduce rejects . . . long life to cut maintenance and capital investment—all add up to Erickson Indexers, the *economical* way to smash automation bottlenecks.



Write for Erickson Catalog K today! **You'll find many interesting applications for all Erickson holding tools. Take advantage of our free engineering service. An Erickson field engineer will gladly work with you for production economy.**

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COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • SPECIAL HOLDING FIXTURES

AA-5137

Walter W Tangeman

Frederick V Geier

Swan E Bergstrom

NAMES IN THE NEWS...

Walter W Tangeman has retired as chairman of the board of the Cincinnati Milling Machine Co. Mr Tangeman, who has served the company for 50 years, will continue as a director. **Frederick V Geier,** president since 1934, has been elected chairman, with the responsibilities of chief executive officer. **Swan E Bergstrom,** who joined the company in 1927, and has served as district manager, sales manager, Machine Tool Division manager, and since 1956 as executive vice president, has been elected president.

Mr Tangeman became associated with the organization in 1908 when, at the age of 16, he enrolled as a cooperative engineering student at the University of Cincinnati. His first work assignment was operating a drillpress at the company's Spring Grove Avenue plant, and he continued as a co-op in other departments until he received his M E degree in 1913. He served in various posts in manufacturing, time-study, shop supervision, and sales engineering. Following World War I service as a Major in Ordnance he returned to the sales department and was named sales manager in 1921. He was elected a director in 1927, vice president, sales, three years later, executive vice president in 1939, and board chairman in 1956.

His many activities include board membership and presidency (1942-43) of the National Machine Tool Builders' Association; member of the executive committee of Machinery and Allied Products Institute; service on the second Hoover Commission and National Management Council; chairman of the American Ordnance-Machine Tool Committee; and president of the University of Cincinnati Research Foundation.

Herman L Schrock, a vice president of Hoover Ball & Bearing Co, Ann Arbor, Mich, has been elected president of the company. **Clifford H Simmons,** chairman of the board, and president, will continue to head the board and has been named chief executive officer to the company. **William L Brittain,** formerly executive vice president, has been elected vice chairman of the board and chairman of the management committee.

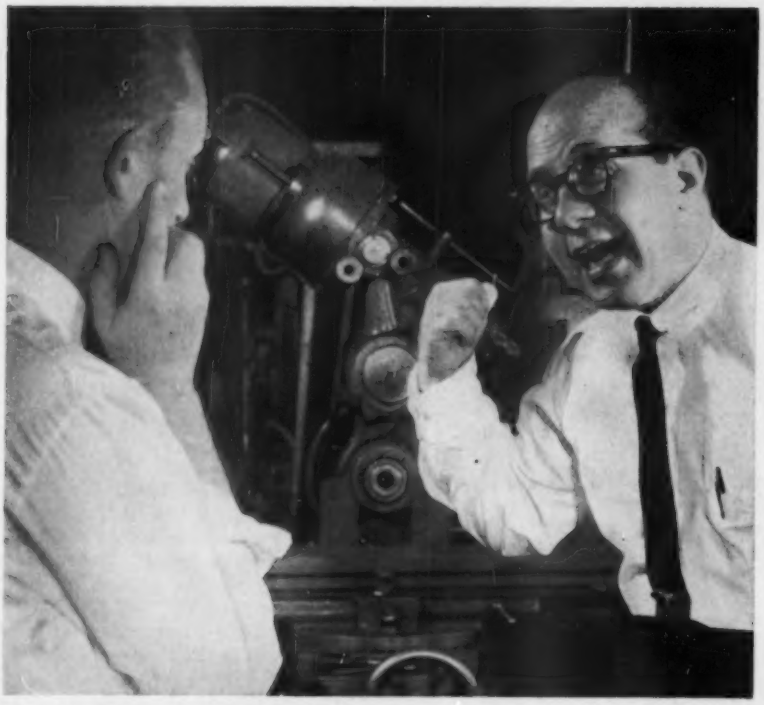
Vernon H Olson has been appointed president of W O Barnes Co, Detroit manufacturer of hack and bandsaw blades. Mr Olson, former vice president in charge of sales, succeeds the late president **J Harry Flavell.**

William R Heath, executive vice president of Buffalo Forge Co, has been elected president. He succeeds **Edgar F Wendt** who is retiring after 47 years' association with the company, 29 of them as president. Mr Wendt will continue an active interest as a director.

Robert C Tyo has been named president of Porter-Cable Machine Co, Syracuse, NY. He succeeds **DeAlton J Ridings** who continues as chairman of the board. Mr Tyo, formerly vice president and general manager, will hold the title of president and general manager and will act as chief executive officer for the company.

NTDMA OFFICERS . . . New officers elected at the annual convention of the National Tool & Die Manufacturers Association, held recently in Philadelphia, are (left to right): Harold G Murdock, vice president of Arrowsmith Tool & Die Co, Los Angeles, second vice president; James A Perdy, vice president of Atlantic Mfg Co, Philadelphia, treasurer; Jack Kleinoder, secretary-treasurer of Volkert Stampings, Inc, Queens Village, NY, president; John D Dewhurst, president of Arrow Tool Co, Wethersfield, Conn, secretary; and John A Barth, vice president of Barth Corp, Cleveland, first vice president

TORIT DUST COLLECTION ENDS THIS:



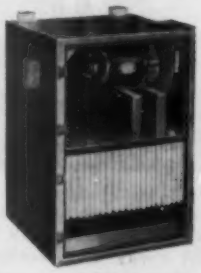
"OUT OF PRODUCTION FOR THREE DAYS? THAT'S WHEN WE'RE SUPPOSED TO SHIP!"

"And believe me, that wasn't all the boss said! Two key machines were so clogged with dirt and grime we had to disassemble and clean them—overnight! Between overtime for the repair crew and our own crew, I managed a partial shipment in three days. And I made up my mind this wasn't going to happen again!

"I'd heard of preventive maintenance with Torit Dust Control equipment—and the Torit representative I called sure opened my eyes! Clean machines hold close tolerances better and up to 80% longer! Torit collectors remove over 99% of dust and air-borne debris, save on both the cost and frequency of servicing.

"I expected there'd be a hitch on prices—but look what I found out: our production breakdown cost nearly as much as the Torit equipment we needed! And just while Torit Dust Collectors are being depreciated we'll make money on them —through maintenance savings, improved production, and reduced down-time!

"The boss actually congratulated me when I showed him the savings Torit preventive maintenance gives us!"



Torit Dust Collectors stop dust build-up before it costs you money. They're available in both high efficiency cyclone and cabinet type units. Why not check into them today—write:

TORIT manufacturing company

Walnut & Exchange Streets, St. Paul 2, Minn. Dept. 420.

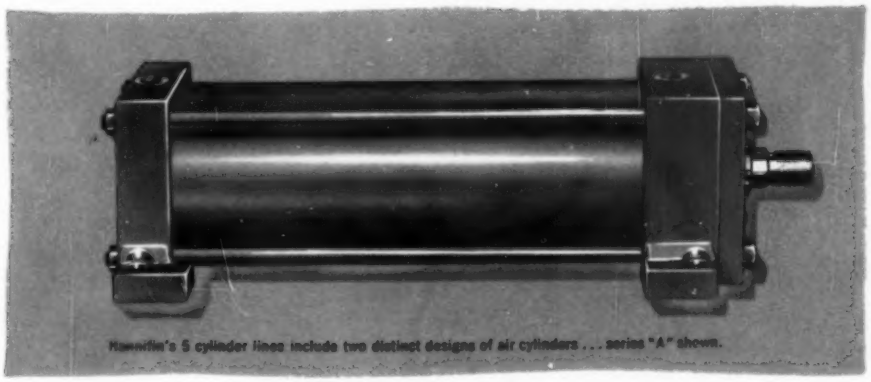
NAMES IN THE NEWS . . .

Herbert H Upton (top) and **Thomas Hollis Jr** have been made vice presidents of Brown & Sharpe Manufacturing Co. Mr Upton will continue to serve as general manager of the Hydraulics Division, and B&S's subsidiary, the Double A Products Co of Manchester, Mich. Mr Hollis will continue in his capacity as general manager of the Cutting Tool Division, and president of another B&S subsidiary, Nelco Tool Co, Manchester, Conn

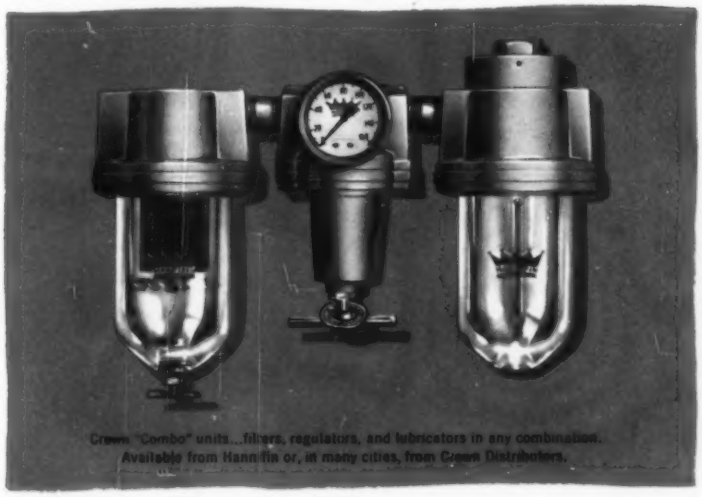
Gordon M Sommer has been named vice president, engineering, for Clearing Machine Corp, division of US Industries, Inc. He has been director of research and development for the past two years

(continued on page 183)

PARKER-HANNIFIN FLUID-SYSTEM COMPONENTS



Hannifin's 5 cylinder lines include two distinct designs of air cylinders . . . series "A" shown.



Crown "Combo" units...filters, regulators, and lubricators in any combination. Available from Hannifin or, in many cities, from Crown Distributors.

Only **HANNIFIN** makes all these **AIR POWER COMPONENTS**

Hannifin valves take many forms. This ⅜" 4-way valve and, sectioned, make a competitive ½" valve.

Anywhere you use compressed air to do work, Hannifin can help you. Hannifin cylinders for the "muscles". . . Hannifin air valves for any type of actuation, hand, foot, cam, solenoid, or pressure . . . the Hannifin "Crown" Line of filters, regulators, and lubricators for lasting air power efficiency . . . all are built by Hannifin to just one standard, the best.

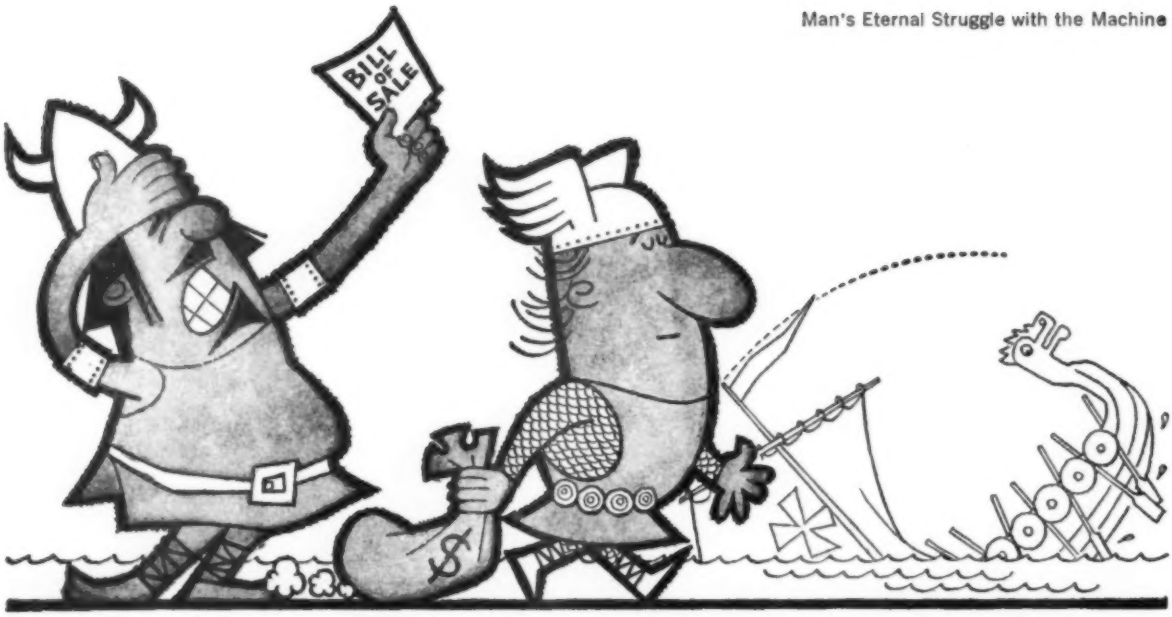
Turn to Hannifin, too, for expert help in applying air power components. A Hannifin field engineer is as close to you as your telephone, wherever you are. Write us for his address—or, he's listed in the alphabetical section of Thomas Register. It's that easy.

HANNIFIN COMPANY

505 South Wolf Road • Des Plaines, Illinois

A DIVISION OF PARKER-HANNIFIN CORPORATION

Man's Eternal Struggle with the Machine



PRECISE DEPENDABLE, AND CONSISTENT FABRICATING EQUIPMENT IS ESSENTIAL FOR PROFITABLE PRODUCTION

Where do equipment builders hide machines that won't work?

Far too many of them are hidden in customers' plants! And many successful men like yourself, who devise production processes and specify equipment, have gained invaluable experience from such painful, vendor mistakes.

But, regardless of the lesson involved, *your overhead* can't afford the lost production time and heavy expense while you rebuild, or test and prove the vendor's equipment for him. No matter how attractive the original price of the equipment, it's false economy if the price tag didn't itemize the extra money required to make it work right.

Sciaky has always accepted full vendor responsibility for delivering equipment *into production* according to your original specifications. That's why Sciaky resistance welding and production equipment is thoroughly tested and proved to do your particular job *before shipment.* That's why Sciaky equipment is commonly installed, qualified, and certified to the most rigid welding specifications in a minimum of time after delivery.

Why take less than the full advantage of consulting with a Sciaky Application Engineer the next time you are considering equipment. No obligation, of course.

Manufacturers who must satisfy the highest requirements of dependability, consistency, and performance for either research and development or production take that advantage.

Documented case histories of manufacturers who have taken full advantage of Sciaky Techniques of Resistance Welding are presented in the publication "Resistance Welding at Work." Write for copies and advise your field of interest.

SCIAKY

67A

SCIAKY BROS., INC., 4933 W. 67th STREET, CHICAGO 38, ILLINOIS • POrtsmouth 7-5600

NAMES IN THE NEWS...

George C Morgan has been named vice president of G A Gray Co, Cincinnati. He was formerly associated with the Continental Gin Co as vice president of its Industrial Division at Birmingham, Ala

W G Dahl, general sales manager of Latrobe Steel Co, Latrobe, Penna, has been appointed vice president, sales. **Howard M Givens,** who formerly held the post, has, at his request, returned to the company's Miami office as southern regional sales manager.

Paul C Sternberg has been elected president of Elkay Manufacturing Co, Chicago maker of stainless steel sinks. **W M Voight** has been named executive vice president, and **Fred W Rexford** vice president, sales.

James M Canaris has been appointed director of engineering of Briggs Filtration Co, Washington, DC. He was previously a member of the sales-engineering staff.

Iver G Freeman, formerly associated with Norton Co, Reed-Prentice Corp, and Package Machinery Co, has joined Johnson & Bassett, Inc, Worcester, Mass, as vice president in charge of engineering and sales

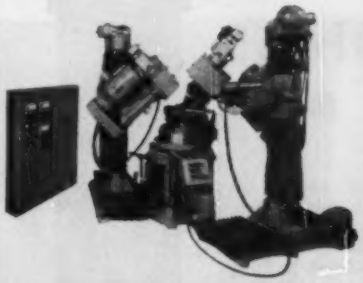
OSBORN®

BEFORE BRUSHING
32-inch diameter sprocket was formerly hand-filed to remove extra-tough burrs. *Hand-finishing time 45 minutes.*

AFTER BRUSHING
Burrs are thoroughly removed . . . rapidly, uniformly . . . at low cost. *Osborn Brushamatic® finishing time: 3 minutes.*

Big, tough burrs . . .
but they finish 'em off in 3 minutes!

. . . it's 15 times as fast with OSBORN Brushamatic® Methods



RAPID DE-BURRING of these 32" sprockets is done automatically on Osborn's 51 Series Brushamatic® Machine. Parts are rotated at 4 rpm against heavy-duty Osborn Keb® Brushes turning at 1750 rpm. Operation is fast, economical and thorough.

This leading gear and sprocket manufacturer has the tough job of deburring king-size parts . . . like this 32" diameter sprocket. Former hand-filing method was slow—45 minutes per part.

Today, they do the same job in just 3 minutes with Osborn Brushamatic® Methods . . . 15 times as fast. Brushamatic is piling up significant dollar savings on the job.

It's typical of how Osborn Power Brushing works to help you speed production . . . cut costs . . . improve product quality. An Osborn Brushing Analysis, made in your plant at no obligation, will show you how. Write or wire us for details—and for your copy of the 20-page Brushamatic® booklet. *The Osborn Manufacturing Company, Dept. C-78, Cleveland 14, Ohio.*

Osborn Brushes

BRUSHING MACHINES • BRUSHING METHODS
POWER, PAINT AND MAINTENANCE BRUSHES • FOUNDRY PRODUCTION MACHINERY

WILLIAMS-WHITE PRESSES
Custom Built to meet your Production Requirements

The 750-ton Hydraulic Press illustrated, in use in a railroad car shop, is typical of WILLIAMS-WHITE machines built to customers' specifications. It is equipped to handle a variety of forming jobs, with pushbutton controls for automatic operation. It can also be controlled manually. The press has platen area 145" x 72", daylight opening, 79½" and stroke 48".

WILLIAMS-WHITE & CO. bring up-to-date engineering know-how to the design and building of machines to fit your production need. Take advantage of our experience to solve your problem . . . today.

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PENNSYLVANIA, Pittsburgh: Frank Ryman's Sons
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WASHINGTON, Seattle: Perine Mach'y & Supply Co.
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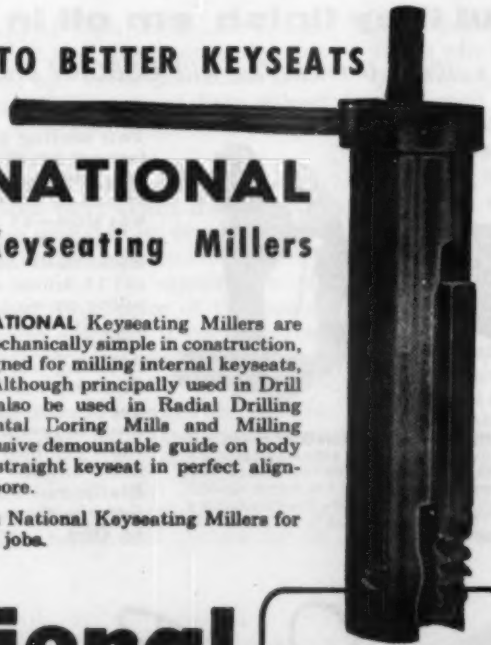
PRESSES • BULLDOZERS • BENDERS • PUNCHES • SHEARS

CIRCLE 293 READER SERVICE CARD

THE KEY TO BETTER KEYSEATS



NATIONAL
Keyseating Millers

NATIONAL Keyseating Millers are mechanically simple in construction, sturdily built, designed for milling internal keyseats, faster and better. Although principally used in Drill Presses they can also be used in Radial Drilling Machines, Horizontal Boring Mills and Milling Machines. An exclusive demountable guide on body of Miller assures a straight keyseat in perfect alignment with axis of bore.

You can depend on National Keyseating Millers for all your keyseating jobs.

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WRITE TODAY
for Catalog No. 17
complete, handy size

How to estimate the time element in any machining job

Use this manual to make the winning but safe bids that mean more jobs and better profits for your shop.

Machine Shop Estimating

BY W. A. NORDHOFF
Douglas Aircraft Company, Inc.

486 pages, 480 illus., $8.00

Here's the kind of on-the-job help you need to make quick, reliable estimates of the time it takes to do the different machining operations in any machine shop, large or small. Whether a job involves drilling, boring, tapping, threading, grinding—or any of the scores of other operations—this handy manual tells you exactly what to consider in estimating job-time.

It covers every step—from setting up a job, to tearing it down—giving the specific time value established for each element. The various non-machining operations which enter into the cost of any job are also given. Instructions are provided for the use of several methods of estimating particular jbs on each type of machine in use today.

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INGENIOUS NEW... UNIVERSAL R&R DEBURRING TOOL

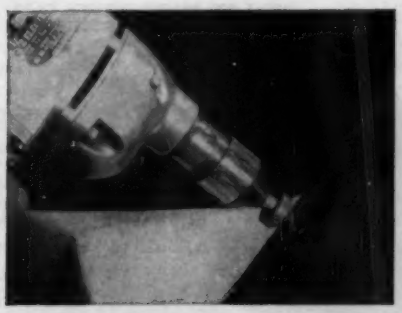
with spring loaded retractable blade

eliminates chatter

gives precision-cut edge or chamfer at high speed

The cutting action of Model 935 Universal R&R chatterless Deburring Tool (on the left) is effected by spring tension against the blade. On Model 936, right, the spring tension is against the body. This is adjustable to regulate the depth of cut. The blade is free-floating to allow self-alignment and uniform stock removal.

The new Universal R&R Tool makes a handy horizontal deburrer when used with a portable drill held in a vise. With proper adjustment, the R&R Deburring Tool is CHATTERLESS. A new design allows the bearing angle of the tool body and the blade to be in continuous contact with the work piece at all times.



R&R Deburring Tool used in electric drill as a portable unit for heavy plate or other objects too heavy to handle. Blades of the R&R Deburring Tool are replaceable at nominal cost from stock. They are made of high speed steel, precision hardened and ground to close tolerances for interchangeability.

Used in any standard drill press at the high operating speeds recommended by the makers of high speed steels, the R&R Deburring Tool performs most efficiently. High operating speeds mean more production, lower costs. Each tool is made in a full range of sizes to 1½" diameter.

UNIVERSAL ENGINEERING COMPANY

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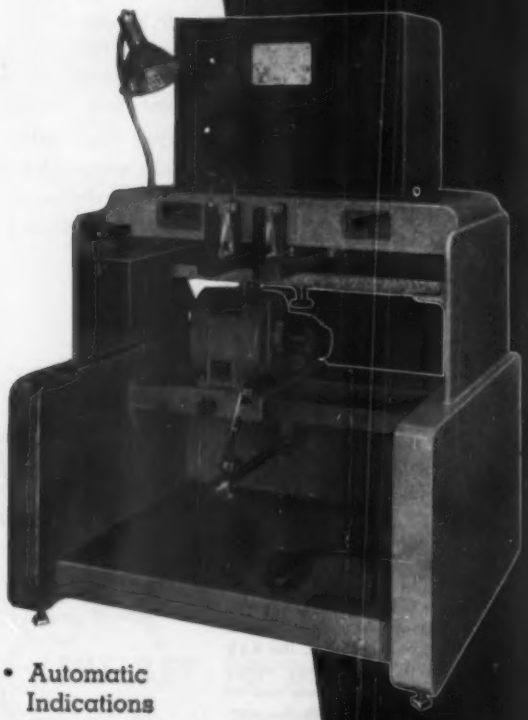
BALANCING MACHINES



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- Single Knob Control
- Superior Accuracy
- Dependable Quality
- 14 Dynamic and Static Models

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DAD? You said you were coming home early. All the other kids' fathers are home. Why don't you use Threadwell cutting tools like they do? That's what Mommy told me to say. Grandpa is a Threadwell Distributor, you know. *Photo by Cobb Shinn for Threadwell Tap & Die Co., Greenfield, Mass.*

CIRCLE 298 READER SERVICE CARD

CAMS OF ALL TYPES

A SPECIALIZED CAM MILLING SERVICE
Over 100 Types of INDEXING TURNTABLES

Also Geneva Gears, Spot and Butt Welding, Positioners for Brazing, Spraying, Welding and Soldering

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Contract production; Special automatic machines

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Stops Losses making Dies and Templates

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead

THE DYKEM COMPANY
2301B North 11th St. • St. Louis 6, Mo.

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END NIGHT CLEANUP & MORNING REBLUING

DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

THE DYKEM CO., 2301B NORTH 11TH ST., ST. LOUIS 6, MO.

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keep your eye on M.B.I.

for machine tools of the future!

DIXI 450 Optical Precision Rotary Table

TODAY... the most progressive products in the industry... TOMORROW, even greater achievements! M.B.I. is continuing to expand its outstanding line of machine tools and accessories in order to serve you better.

DIXI 60

horizontal optical jig borer

(Made in Switzerland—Measurements in Inches)

The only horizontal jig borer that combines the accuracy of the vertical spindle with the versatility of the horizontal spindle.

ACCURACY: Optical settings provide an overall accuracy of .0002".

VERSATILITY: The combination of the Dixi 60 and the Dixi 450 precision optical rotary table (illus.) permits jig-less boring, facing, milling and drilling work in all planes and compound angles between them with optica interrelationship all in one set-up.

PRODUCTIVITY: A complete optical setting, including unclamping, positioning, fine adjustment, reclamping and rechecking takes less than 10 seconds. Convenient and functional controls eliminate idle machine time.

The **DIXI** Optical Reversing Process assures perfect alignment in work pieces with line bores, as well as round, taper-free holes. Get all details on this process by writing for illustrated catalog.

MBI has engineers available for consultation, guarantees service by factory trained staff, and stocks spare parts in New York. Join the long list of leading aircraft and manufacturing plants throughout the United States which are using the Dixi 60.

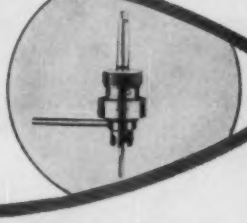
All tools shown here are tested for performance to American Standards.

Distributors inquiries invited.

Write for literature and detailed information to:

REVERSIBLE SAFETY TAPPING ATTACHMENTS

With adjustable graduated friction drive, hardened, ground and lapped. Precision made throughout.



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CAPACITIES UP TO ½".
ALL OPERATING PARTS HARDENED AND INTERCHANGEABLE.
SELF-TIGHTENING: tighten the easy-grip sleeve by hand and the tool is chucked. Drill does not slip since the gripping power of the chuck increases with the load. Chuck easily opened by hand despite tremendous gripping power.

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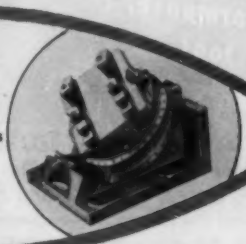
Horizontal and vertical swivel. 4 stepped jaws permit clamping of even rough castings, and irregularly shaped pieces accurately and quickly, eliminates special jigs or fixtures. Narrow jaws allow free access to and measuring of work pieces and provide clearance for cutting tools. Rigid in any position.



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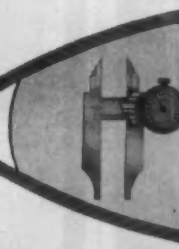
Eliminate costly reading errors. Dial indicator reads directly in .001".

5", 6", 8" and 10" capacities, in tool steel or stainless steel. Thumb roll permits quick and easy operation. Knurled lock screw. Beam and jaws fully hardened, ground and lapped.



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475 Grand Concourse, Bronx 51, N. Y. "Over 25 years' experience in designing and building machinery"

BOSS . . . you haven't walked me around the block for weeks, and you know what weak kidneys I have. Why don't you see your Threadwell Distributor for high performance cutting tools. You'll get home from the shop a lot quicker, and I won't have to lead such a man's life. *Photo by Cobb Shinn for Threadwell Tap & Die Co., Greenfield, Mass.*

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Rubber Mill Drive requirements dictated the specifications of this Meehanite spur bull gear—72½" O.D., 12" F., 143 T., 2 D.P., H-type arms. Stahl has the experience, the ability and the precision equipment to guarantee unfailing accuracy on every job. Prompt delivery and moderate cost, too. For gears—any size, type or quantity—get Stahl's estimate first.

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- Spindle head tilts for oblique holes up to 15° from vertical

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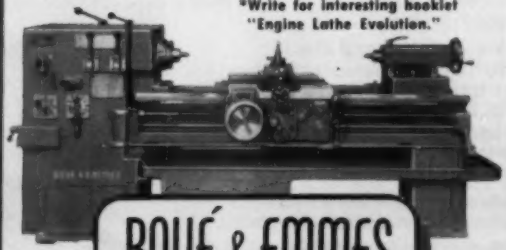
Write about it
Come see it

*Write for interesting booklet "Engine Lathe Evolution."



BOYÉ & EMMES
MACHINE TOOL COMPANY
125 CALDWELL DRIVE
CINCINNATI 16, OHIO
MACHINE TOOL CENTER of the WORLD

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FINE PATTERN on 11" diameter "plunger" forms molding surface for press to make abrasive wheels. The Carborundum Company.

Airkool-S retains precise size and shape through heat treatment

Forming this precise pattern is easily accomplished with Airkool-S, a tough, sulphur-bearing, air-hardening tool and die steel with good machinability. Its excellent nondeforming properties are important too, because this pattern must be retained, without distortion, through heat treatment.

Because Crucible Airkool-S is consistently uniform and clean, no objectionable irregularities appear on this fine pattern. Furthermore, Airkool-S is much more abrasion resistant than typical oil-hardening tool steels, and is substantially tougher than high-carbon, high-chromium types.

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Wolverine

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New QUICK ACTION MODEL CQ-1107
Includes These Important Features:

- ✓ HARDENED PINS and BUSHINGS
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- ✓ HEAVY BODY SECTIONS
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Wolverine manufactures a full line of Toggle Clamps, including standard action–push action –and quick action units.

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are accurate, reliable and built to stand hard usage.
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The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.

This style instrument can be furnished with various dials, graduations and ranges, in both English and Metric. There is an R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

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Makers of Dial Gages Since 1898

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Here is a comprehensive *American Machinist* Special Report on one of Metalworking's most useful and versatile machines. Production executives will find this fully illustrated report particularly useful as an aid in training apprentices and new operators of engine lathes.

"How to Run an Engine Lathe" covers in detail the parts of, and operation of the engine lathe. Turning tools and the various turning operations, plus lathe attachments and care, are examined at some length.

Copies of this valuable Special Report are available to you at 25 cents each.

16 pages — 25 cents each

READER SERVICE DEPARTMENT
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Faster Cutting—Longer Life

Tests have proved Manhattan Moldiscs to be the most economical portable grinding wheels you can use on right angle grinders . . . even on the toughest roughing and finishing jobs. They're custom-made to meet specific job requirements for use with mild steels, stainless alloys, aluminum or copper. Every turn of a Manhattan Moldisc exposes a fresh, sharp abrasive cutting surface right down to the last usable part of the wheel . . . *without* loading *or* glazing. They're safer and easier to use because they're light in weight, easy to control . . . and reinforced with special super-strength synthetic fabrics.

Manhattan Moldiscs are available in a wide range of types from harder, stiff bonds for fast roughing . . . to resilient, flexible bonds for fine finishing. Ask a Manhattan abrasive wheel engineer to show you how Manhattan Moldiscs and other Manhattan high speed, heavy duty abrasive wheels do a *better* cutting or grinding job and last *longer* . . . give you "More Use per Dollar".

RM-939

GRINDING WHEEL INSTITUTE MEMBER

WRITE TO THE ABRASIVE WHEEL DEPARTMENT

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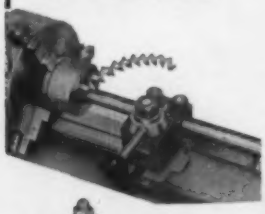
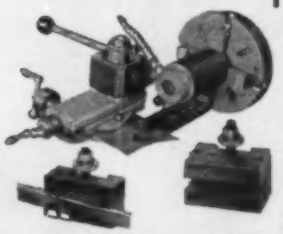
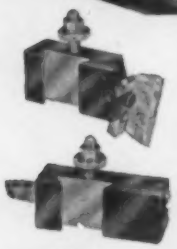
ALORIS
QUICK CHANGE
TOOL POSTS & TOOL HOLDERS

FOR MAXIMUM VERSATILITY & RIGIDITY







Change tools instantly—for turning, facing, drilling, boring, threading, knurling, cutting off or any operation.

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- Greater Rigidity
- Leading Lathe Mfrs. Recommend It
- Sizes to Fit Every Lathe
- Unconditionally Guaranteed

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The most complete line of tool posts and holders. Write for Catalog & Price List.

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A Boring Head That Won't Face is NOT Complete

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LOOK INTO THIS before you buy that new head. Write for full details.

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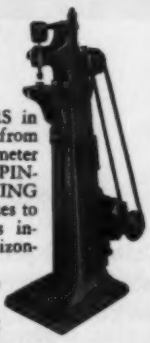

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THE GRANT MFG. & MACHINE CO.
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SHORE SCLEROSCOPE HARDNESS TESTERS

Pioneer American Standard

SINCE 1907

Available in Model C-2 direct reading or in Model D dial indicating with equivalent Brinell and Rockwell C Hardness Numbers. May be used free hand or mounted on bench clamp. Sensitive over entire range from softest to hardest of metals without adjustment. Non-injurious to work.

OVER 40,000 IN USE

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90-35B Van Wyck Exp.
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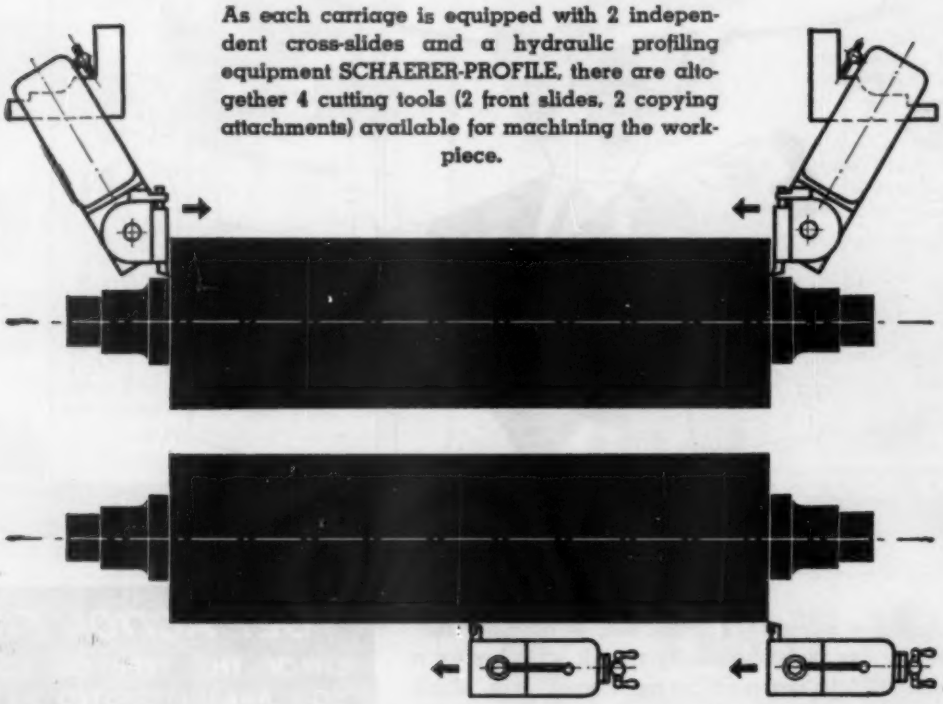
For machining rolls and similar workpieces.

SCHAERER Lathes with 2 carriages.

As each carriage is equipped with 2 independent cross-slides and a hydraulic profiling equipment SCHAERER-PROFILE, there are altogether 4 cutting tools (2 front slides, 2 copying attachments) available for machining the workpiece.



SCHAERER-Lathe Model UD 1000.
Drive 30 HP. Weight of workpiece 4,5-5 t.
Swing over carriage 27"

IWK

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Agency: All American Corporation

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DRILL, UPRIGHT. 24" Cincinnati Bickford, tapping, No. 4 MT power feed
DRILL. No. 20HO Baker hydr. late
GRINDERS, C'LESS No. 12 Landis, 1947
GRINDERS, CYL. 4" x 12" No. H Landis, 1943
GRINDERS, UNIV. 14"x14" Mod. 112 Rivett, 1942
GRINDERS, CYL. 20" x 72" Landis, 1943
GRINDER, INT. 72AS Heald, Univ., Hydr.
GRINDER, INT. No. 74 Heald Hydr., plain, 1941
GRINDER, INT. No. 75A Heald hand feed
GRINDER, SURF. 8" x 24" DoAll hydr. 1948
GRINDER, SURF. 20" and 24" No. 25A Heald
GRINDER, SURF. 36" Nos. 18 & 18 Blanchard, 1940
GRINDER, CUTTER. 30" Ingersoll, 1942
GRINDER, CARBIDE. Nos. 40 & 40 Excello, 1941
GRINDER, RADIUS. No. 40 Van Norman, late
GRINDER, TOOL & CUTTER. No. 2 Cincinnati
HOB SHARPENER. Type HRS Barber Colman
KELLER. BL2416 Pratt & Whitney 3 Spdl., 1941
LATHES, ENGINE. 13", 15" & 17" Lelliend Regals, new
MILLER, AUTO. 36" No. 33 Sundstrand
MILLER, HAND. No. 2RV Kent-Owens, 1942
MILLERS, No. 10 & 3 Van Norman Duplex
MILLER, PLAIN. No. 3H K&T MSDT 1948
MILLER, PLAIN. No. 2 Cincinnati
MILLER, VERTICAL. No. 2 Brown & Sharpe, 1943
MILLER, No. 3B Van Norman, ram type 1942
ROUTERS. Type A-1R Onsrud Radial 84", late
SAW, 6" x 6" No. 6 Marvel Hack, late
SAW, 10" x 10" Racine Hydr. Hack, 1941
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CENTERLESS GRINDERS
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CARBIDE GRINDERS
No. 40C Excello Carboloy, m.d.

CRANKSHAFT GRINDERS
18x60" Landis Universal Type C, m.d., late
22x72" Landis Type CH, m.d., late

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No. 50 Heald, m.d., 1945
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No. 78 Heald Centerless Cylinder, m.d.

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No. 5D Gardner H.D. Polishing Stand

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No. 18B—36" esp. Gardner, m.d., latest
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Model 372—33" Besly Single Spindle Vertical, m.d.

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No. 18A-2 Blanchard Auto. Rotary, m.d.
No. 33 Abrasive, m.d.
14" Pratt & Whitney Vertical, m.d.
14" Pratt & Whitney Model M 1640 Vertical, m.d.
No. A-1—8" Arter Surface Grinder
No. 22—12" Heald Rotary, m.d.
No. 25-A—24" Heald Rotary, m.d.
No. 2 Brown & Sharpe, m.d.
#320—60 Hanchett Vertical Spindle, m.d.
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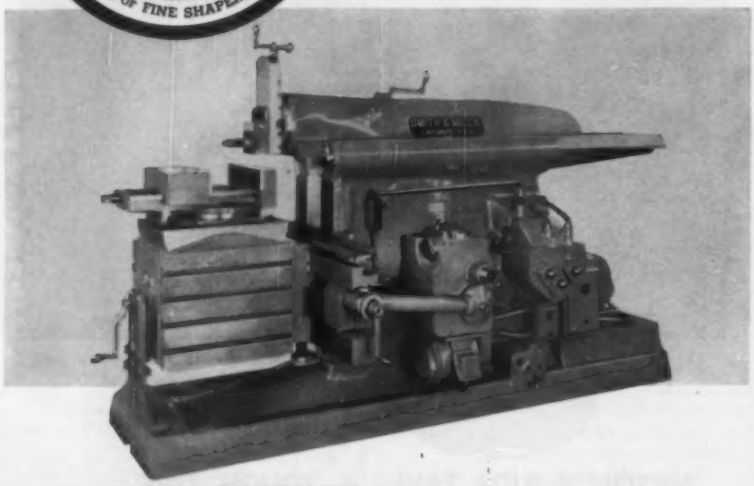

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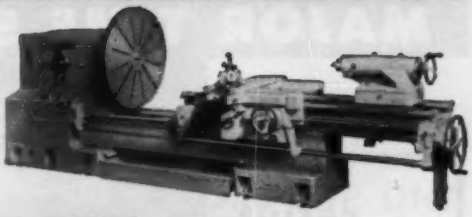
EXTENSION BED GAP LATHES

The new XB series shown here is but one of three different extension bed gap lathes in the Nebel line: XB series 26″/45″; AG series 20″/40″; G series 28″/50″.



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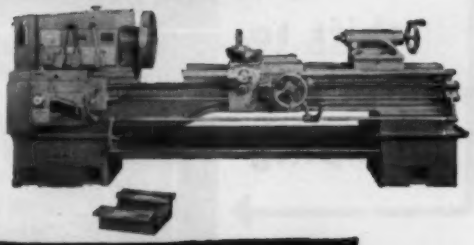
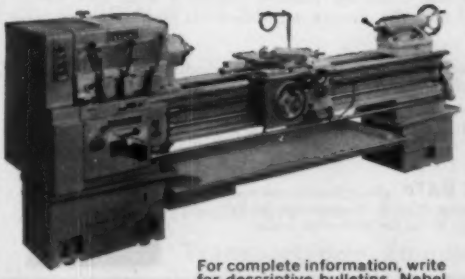


STANDARD LATHES



Now more substantial, with larger, heavier aprons, carriage and tailstocks. Made in six sizes: 16″ and 20″ shown at left; also 25″, 27″, 32″ and 36″. All Nebel lathes have shaved and hardened headstock gears, Timken antifriction bearings throughout.

For complete information, write for descriptive bulletins, Nebel Lathe Division, Nebel Machine Tool Corp., 3407 Central Parkway, Cincinnati 25, Ohio.

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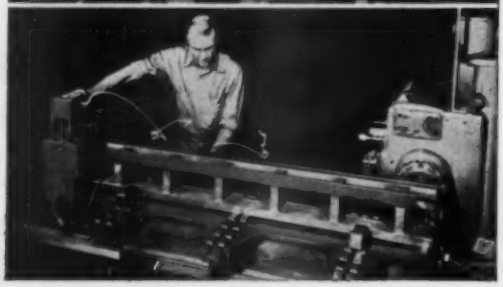

Wrist lights tell the story in these two photos. The job is the same—only the clamping method changes. Note how the excessive motion required with mechanical clamping (top view) is eliminated with the change to Sundstrand magnetic clamping (lower view).

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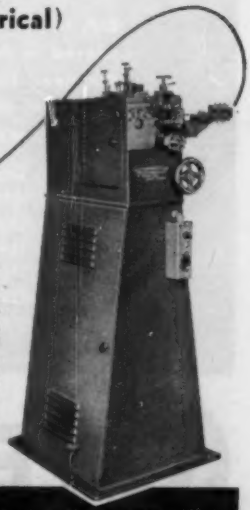

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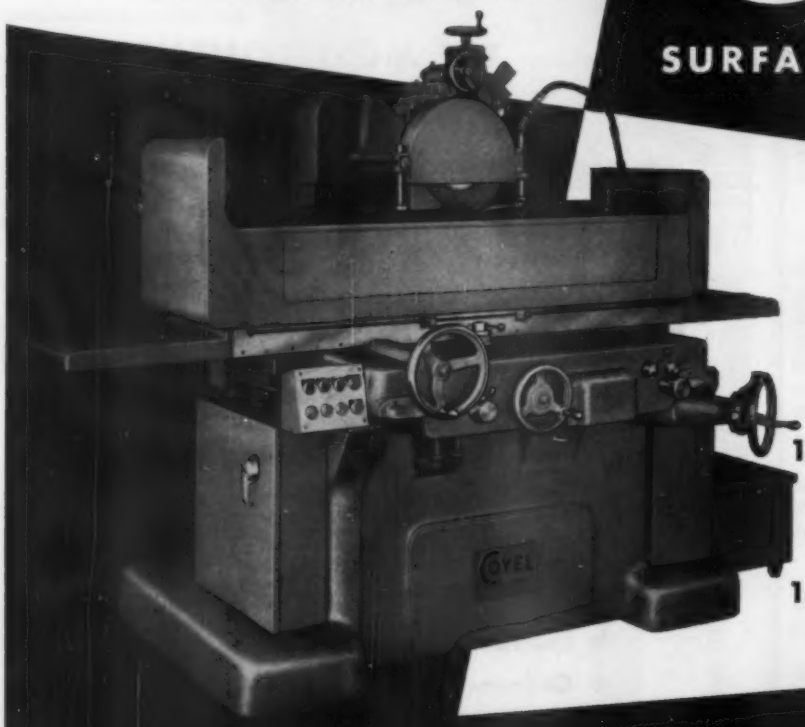

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The manufacturer accepted these recommendations . . . and thus eliminated a potentially serious problem before it could develop. The torque settings and technique developed by the Stanscrew representative have been incorporated in the company's instruction and maintenance manual to insure proper maintenance procedures.

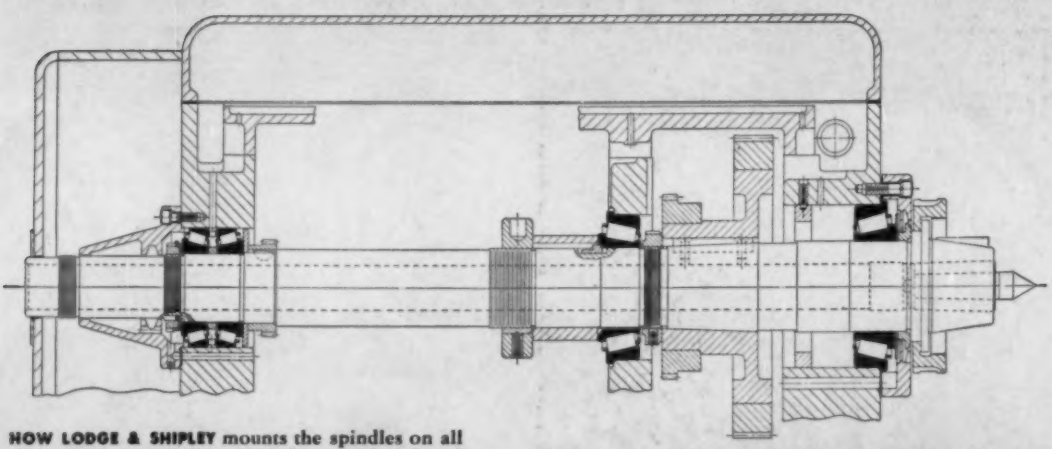
Technical assistance like this is just one of the many reasons more and more manufacturers are standardizing on Stanscrew. Trained specialists, backed by an outstanding engineering staff, can solve your particular fastener problem. In addition to assuring the dependability of your product, often they can save you money . . . for example by substituting a standard fastener for a costly "special".

Call your Stanscrew distributor today for the answers to your fastener problems. He will see that the Stanscrew Fastener Specialist visits you without delay.

STANSCREW FASTENERS

CHICAGO | THE CHICAGO SCREW COMPANY, BELLWOOD, ILLINOIS
HMS | HARTFORD MACHINE SCREW COMPANY, HARTFORD, CONNECTICUT
WESTERN | THE WESTERN AUTOMATIC MACHINE SCREW COMPANY, ELYRIA, OHIO

STANDARD SCREW COMPANY 2701 Washington Boulevard, Bellwood, Illinois



HOW LODGE & SHIPLEY mounts the spindles on all 2013 Powerturn lathes including both 45° and 90° Copymatics on Timken bearings to get extra rigidity, maintain accuracy, reduce maintenance.

New type lathe ups production 200%, saves users an estimated $8,000 a year

...one secret—TIMKEN® bearings on the spindle

"Production increases as high as 200%"..."Overall savings estimated at $8,000 a year"—read user reports about the new 2013 Powerturn 90° Copymatic Lathe. One important reason for such exceptional results is that Lodge & Shipley mounts the spindle on Timken® tapered roller bearings. Timken bearings give it the vital extra rigidity and hold runout to the minimum needed for tracer accuracy.

How spindle is held rigid. Timken bearings hold the spindle in positive alignment. They take *both* radial and thrust loads in any combination, because of their tapered design. And because of full line contact between rollers and races, Timken bearings have extra load-carrying capacity.

Why heavy shocks are absorbed. Case-carburization of Timken bearings' rollers and races gives them hard, wear-resistant surfaces and tough, shock-resistant cores.

How friction is virtually eliminated. Timken bearings are geometrically designed to roll true. And they're precision-made to live up to their design. They run smoother—last longer.

We even make our own electric furnace fine alloy steel, for extra quality control. We're America's only bearing maker that does. To get all these advantages, always specify bearings trade-marked "TIMKEN". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

TIMKEN *TAPERED ROLLER BEARINGS ROLL THE LOAD*

TRADE-MARK REG. U. S. PAT. OFF.